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## ALLERGY IN OTORHINOLARYNGOLOGY AND OPHTHALMOLOGY. A REVIEW OF THE RECENT CURRENT LITERATURE.

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A review of the recent literature on the subject of allergy as related to otorhinolaryngology and ophthalmology shows an increasing interest in this field. Progress has been slow, however, and there is much need for more specific attention to the allergic diseases as related to these specialties. The symptoms of nasal allergy have been recognized for a long time. The nasal changes, such as pallor, edema and polyposis, are everyday observations. The demonstration of eosinophiles in nasal secretion in hay fever, asthma and spasmodic coryza was reported 50 years ago by Gollasch.<sup>1</sup> The classic pathologic changes in the nose and sinuses, characterized by edema and eosinophilic infiltration, were reported in the German literature by Lewy,<sup>2</sup> Seifert and Kahn<sup>3</sup> 45 years ago. The failure to make a definite distinction between allergy and the suppurative diseases of the paranasal sinuses, until only a few years ago, has resulted because of the lack of the correlation of these findings. One of the most important points in the diagnosis of nasal and sinus allergy is the determination of the cytologic findings in the secretions. And yet comparatively few otolaryngologists take advantage of the valuable information offered by this simple procedure. Accurate diagnoses are often impossible without cytologic studies.

There are entirely too many submucous resections, sinus operations and tonsillectomies being performed today with-

out due consideration of allergy. The results which can be obtained in nasal and sinus allergy cases by allergic management are most satisfactory and every patient of this type should have the advantage of the relief which is offered by this method of treatment. Although surgical procedures are indicated in certain selected cases, results will not be satisfactory unless the allergic factors are controlled.

Other manifestations, such as asthma, allergic bronchitis, bronchiectasis, gastrointestinal allergy, allergic headache, urticaria, eczema and angioneurotic edema, are not infrequently associated with those in the nose and paranasal sinuses. These manifestations must also receive proper attention from the allergic standpoint.

The important part played by allergy in otolaryngology necessitates greater accuracy in diagnosis and more conservative surgical procedures on the nose and paranasal sinuses. There must be also a closer co-operation between the otolaryngologist and the allergist, or the otolaryngologist must acquire an adequate working knowledge of the subject of allergy in order that he may be able to institute the proper treatment.

#### BIOCHEMISTRY OF SECRETIONS AND TISSUES.

Extensive investigation on the biochemical changes in the blood in allergy have shown no significant alterations. On the other hand, studies of nasal and bronchial secretions have shown definite variations in the pH and percentages of electrolytes under various conditions of allergy and infection. It is significant that considerable amounts of calcium are lost in allergic secretions. Much also remains to be known about lysozyme and other enzymes, antibodies and possibly hormones in nasal and bronchial secretions.

Daly<sup>4</sup> has shown that lysozyme is present in normal nasal mucus. He described a method of obtaining sterile preparations from nasal mucus. His experiments showed that nasal lysozyme in sufficient concentrations caused staphylococcus aureus, streptococcus hemolyticus and pneumococcus III to grow in a granular manner. In one experiment, pneumococcus III suffered some loss of virulence as a result of contact with nasal lysozyme. Although the results of these experiments on pneumococcus III were considered inconclusive, they

seem worthy of note since they are in agreement with the findings of others.

Buhrmester's<sup>5</sup> report represents further studies on the hydrogen ion concentration of nasal secretions in various diseases of the respiratory tract. In all, 350 determinations were made on 125 patients. The conditions presented were as follows: Six had atrophic rhinitis; 11 had bronchoscopic treatment; 25 had colds; and 83 had nasal allergy, complicated or uncomplicated by infection. It was noted that loss of weight is reflected in the nasal secretion by an increase in the hydrogen ion concentration. The secretion during colds is alkaline in the initial stage and the pH decreases to normal as clinical improvement takes place. She finds that the initial physiologic response of the nasal mucosa to stimulation is similar, regardless of the inciting agent.

In 387 asthmatic patients examined by Griebel,<sup>6</sup> it was found that 293 presented evidence of the allergic form of the disease. The pathologic conditions in the nose varied from the presence of simple serous fluid to marked polyposis. Chronic suppuration was found in 176 of 293 patients. This incidence of chronic suppuration is much higher than that noted by other observers. Physicochemical examinations made of nasal polyps revealed a relatively high mineral content and a hydrogen ion concentration of from 7.52 to 8.3. It was concluded that albumin plays a decisive part as the hydrophilic colloid in the development of polyps.

A few further observations on the reaction of the nasal mucus were reported by Tweedie.<sup>7</sup> Previous findings, in general, were confirmed. It was found that the normal nose possesses a mucus with a reaction varying from pH 6.5 to pH 7.4, and a nonculturable content. In acute rhinitis it was found that the normal reaction is not affected for some two or three days and during this time no culturable content is present. After that time a culturable growth of the common inflammatory organisms is obtainable for some three weeks. It was stated that chronic rhinitis may exist in connection with purely mechanical factors; for example, obstructive deviation of the septum, postoperative conditions in clean cases, or only as the result of traumatic lesions; also in hay fever, so-called spasmodic rhinorrhea and asthma, and even in some cases of

rhinitis associated with sinusitis and polypi or syphilis. In all of these cases an unaltered reaction of the nasal mucus and a nonculturable content may be found. On the other hand, Tweedie states a chronic rhinitis may show abnormal alkalinity and reveal a culturable content obtained on a medium corresponding to the reaction of the mucus or only demonstrable on a medium of greater alkalinity.

As far as cultures were concerned, no growth was obtained from any nose on a medium of pH 6.5 with the exception of staphylococcus aureus and staphylococcus albus, which grow freely on any medium. Staphylococcus albus was regarded merely as a result of contamination and not pathogenic. The usual findings are some forms of streptococcus. It was further stated that this bacterial growth in the nose, therefore, does not take place until and if the normal reaction of the nasal mucus becomes alkaline, and the growth must thus be regarded as a secondary infection, only virulent when some other condition induces an alkaline reaction of the nasal mucus. It was also pointed out that a normal reaction of the mucus is not the only safeguard since other factors must certainly take part; for example, lysozyme, the action of the cilia and probably the presence of a structurally normal nose.

A biochemical study of nasal mucin was undertaken by Buhrmester.\* She found that nasal mucin is not identical with any mucin from other tissues or secretions. The polysaccharide of mucin was obtained free from protein and identified only by its general physical characteristics. It was shown that the viscosity of mucin is decreased by increase in temperature and by the presence of ionizable salts. The stirring of mucus decreases the viscosity.

According to the investigations of Buhrmester and Wenner," nasal polypi and normal mucous membrane contain a histamine-like substance in approximately equal amounts in the moist tissue. Calculated on the basis of dry weight of the tissue, polypoid tissue contains more histamine than normal membrane. It was found that the nasal secretion from persons with allergic rhinitis does not have depressor activity when injected intravenously. The hydrolyzed secretion contains much less histamine-like substance than do polypi, calculated on actual protein values. Histaminase was not found to



be present in allergic nasal secretions. It is suggested that the increase in mineral content of the nasal discharge, with the resulting effect on permeability, difference in potential and acid-base equilibrium, are factors to be considered in studying the formation of polypi and other allergic manifestations.

Deilmann and Kutcher<sup>10</sup> found, in studies on the behavior of the protein nitrogen in the secretions in acute and chronic disorders of the accessory sinuses, that a single determination of the protein does not permit a conclusion as to whether the process is acute or chronic. Serial examinations reveal, in cases of acute sinusitis, great, irregular fluctuations of the protein content, between 1 and 9 per cent. In cases of chronic sinusitis, the protein content is more stationary, with variations from 3 to 5 per cent.

In discussing the biochemical aspects of sinus disease, Ruskin<sup>11</sup> states that in the paranasal sinuses there is a mechanism favoring the transudation of discharge rich in nucleoproteins, while in the nasal mucous membrane the secretory structure produces a discharge rich in mucoproteins. He further states that a loss in nucleoproteins from the sinus mucosa results in a hyponucleinemia, causing changes in the blood comparable to those occurring in nephrosis. The severe loss of secretions from the nasal and pharyngeal mucosa is viewed as associated with the loss of mucoproteins, and these substances are used by the liver and kidney in the detoxicating mechanism, and their deficiency is associated with the picture of acute toxic nephritis. Ruskin reports a series of 53 cases of nasal allergy, five of which are described in detail, showing marked benefit from the ingestion of nucleic acid (yeast). These observations, he believes, indicate that allergy is related to a depression of nucleic acid, possibly secondary to chronic infection that has caused a continuous drainage of nasal secretion. He also found that the administration of nucleic acid was of benefit in cases of nasal polyposis. He concluded that the loss of nucleoprotein manifests itself as a deficiency in some cases and appears to be a disturbance of water metabolism related to nephrosis.

Fox and Harned<sup>12</sup> noted that the nasal mucosa of hogs offered a resistant tissue for experimental purposes because

the incidence of rhinitis in this animal is low. They have tried various methods of obtaining extracts of the nasal mucosa. The protein elements seem to cause severe reactions. An attempt is being made to obtain a material of a hormone nature. They used a protein-free extract, which appeared to give some promising results when used both orally and hypodermically as a protection against colds. While no definite conclusions are as yet drawn from the results obtained, the use of these extracts, in some cases, has been striking. The possibility of a nonspecific effect, however, cannot be eliminated, especially in those instances in which the rhinitis may be of an allergic nature.

Chavanne<sup>13</sup> concludes that clinical observations reported in the literature coincide with the results of his experiments as to the relations of the nasal secretion and endocrine glands. Castration is followed by atrophy of the glands of the nasal mucosa and lowering of the functions of secretion of the mucosa. Pathologic conditions of the nasal mucosa resulting from diminished or increased function of the genital organs, as well as transient disorders of the nasal mucosa in the course of menstruation and pregnancy, are reported. The anterior lobe of the hypophysis and the thyroid inhibit the nasal secretions. The same result is obtained by administration of extracts of the anterior lobe and the thyroid. Thyroidectomy increases nasal secretion. Thyroid extracts act through their effects on the thyroid. Extracts of the anterior lobe of the hypophysis act by controlling several endocrinotropic substances which are concerned with the nasal secretion.

The occurrence of satisfactory results sometimes noted in allergic patients following the administration of one or more endocrine gland extracts, suggests that they must play a part in the allergic mechanism.

Studies on the supposed relation between autonomic imbalance and the color of the septum were undertaken by Bilchick.<sup>14</sup> Investigations of this type are particularly interesting in view of the changes in the color of the nasal mucosa observed in nasal allergy. Bilchick confirmed Bernheimer's<sup>15</sup> observations by showing the absence of relation between the color of the septum and autonomic imbalance. In a series of 100 cases, no relation was found between the color of the

septum and blood pressure, blood sugar, blood nitrogen, basal metabolic rate or red cell count (except in severe anemia).

#### CYTOLOGY OF SECRETIONS.

The value of the determination of the cytology of the nasal secretions in allergic and nonallergic individuals with nasal symptoms is exemplified in the extensive observations of Cowie and Jimenez.<sup>16</sup> The cytology of the nasal secretions was studied in allergic individuals free from infectious colds. Such types as pure hay fever, hay fever plus other sensitivities, multiple sensitization but not to pollen, and sensitization with an associated epidermal sensitivity were considered in one group. The second group of cases consisted of sensitized persons in whom the cytology of the nasal smears was studied during the period of infectious colds. Comparative simultaneous differential counts of the blood and nasal secretions were also made. On the basis of these studies, the authors state that an eosinophile count in a nasal smear of from 20 to 25 per cent indicates that the patient is allergic. The percentage of eosinophiles seems to be greater in patients with epidermal sensitization. During an infectious cold, it was found that the neutrophils predominate in the cytologic picture, with or without varying percentages of eosinophiles. Comparative simultaneous differential counts of the blood and nasal smears did not show a definite relationship to each other. Attention was called to the fact that the typical pale, boggy mucous membrane may not be present in nasal allergy but eosinophiles may be demonstrated in the nasal secretions.

Attention should be called to the fact that the computation of the number of eosinophiles and neutrophils in nasal smears in terms of percentages is subject to considerable discrepancy unless the cellular distribution is uniformly even. For example, the clumping of eosinophiles in masses in the presence of a large number of neutrophils is not infrequently noted in cases of nasal allergy with acute infection. Although the cytologic picture may be diagnostic of allergy, the relative proportions of the two types of cells in terms of percentages may not be significant. Considerable variation in the relative numbers of eosinophiles and neutrophils occurs, dependent upon the particular stages of an acute rhinitis superimposed upon an allergic process. During the early stages of a cold, the neutrophils may completely predominate the picture. As a

rule the number of eosinophiles shows a significant increase in the late stage of the cold when the neutrophiles begin to disappear.

According to the investigations of Hume,<sup>17</sup> the cytology of the nasal secretions is of indispensable value in the diagnosis of all types of rhinosinusitis. He emphasizes the importance of the demonstration of eosinophiles in the nasal secretions in the diagnosis of allergy. He also discusses the significance of neutrophiles, lymphocytes, monocytes, and their relation to the various types of sinusitis.

Kallos<sup>18</sup> made a study of 125 cases of nasal and tonsillar diseases in which the secretions were examined for eosinophiles. In the nasal cases, consisting of vasomotor rhinitis and nasal polyps, eosinophiles were found to be present in from 10 to 50 per cent. An eosinophilia was also demonstrated in secretions expressed from the tonsils in rheumatic patients. Definite eosinophilia was also demonstrated in the tonsils upon histologic examination. Similar studies in non-rheumatic patients revealed no eosinophilia. Kallos suggests a possible association between the tonsils and rheumatism on the basis of the local eosinophilia.

#### ALLERGIC LESIONS OF THE OROPHARYNX AND LARYNX.

Arslan<sup>19</sup> was able to produce the Arthus' phenomenon in the velum pendulum palati of rabbits by means of a submucous vena injection of horse serum repeated at regular intervals. The development of the Arthus' phenomenon was found to be slower in the oropharyngeal than in the submucous tissues of rabbits, and the oropharyngeal lesion is smaller than the subcutaneous lesion, probably because the reactivity of the submucous tissue to local sensitization is diminished as compared to that of the subcutaneous tissue. The same experiments carried on in guinea pigs failed to produce the Arthus' phenomenon in the oral mucosa.

Aphthous stomatitis and canker sores have long been known as possible manifestations of allergy. More recently, certain cases of gingivitis have been recognized by the dentist as of allergic origin. Gingivitis not infrequently occurs from dentifrices.

Loveman<sup>20</sup> reports an interesting case of stomatitis of the

contact type. The lesions were confined mostly to the area surrounding an artificial denture. Marked positive patch tests were obtained to the cream which the patient used in cleaning the denture. The active ingredient in the cream was found to be anethol. Dermatitis was also present on the left hand, in which the denture was usually held in the process of cleaning. Passive transfer of the sensitivity was unsuccessful.

The cutaneous lesions of allergic purpura are not infrequently encountered in association with gastrotintestinal lesions. Lesions of the upper digestive tract, however, are comparatively rare.

Three very interesting cases of purpura with faucial lesions were reported by Watson-Williams.<sup>21</sup> In two instances the lesions followed the administration of novarsenobenzol. In the first patient there was bleeding from both sides of the nasal septum. On the posterior wall of the pharynx there was a large purple bulla with bleeding edges. There was also bleeding from the tonsillar fossae. By endoscopic examination, lesions were noted in the esophagus. A few purpuric spots were also noted on the extremities. Recovery followed discontinuation of the drug treatment.

The second patient showed violet-black staining of the mucosa of the anterior faucial pillars, the gum margins adjacent to the teeth in both jaws, and the inner surface of both cheeks opposite the molars. There were no cutaneous lesions in this case. The patient recovered after discontinuation of the injection of novarsenobenzol.

The third patient had purpuric lesions of the nose, mouth and pharynx. She also had some purpuric skin lesions of the chin and neck. The purpura in this case followed the ingestion of "aspro" tablets. The faucial lesions were very extensive. The patient completely recovered.

Lesions of the nervous system secondary to serum reactions have been noted to involve most frequently the brachial plexus. While involvement of the central nervous system may also occur, peripheral nerve lesions are the most common. Practically all of the cranial nerves have been reported as involved as isolated individual lesions. A very interesting case of recurrent paralysis of the larynx following the injection of tetanus antitoxin was reported by Neffson.<sup>22</sup> The patient

was a male, age 19 years, who, after the injection of 1,500 units of tetanus antitoxin, developed first an urticaria, later generalized muscular and articular pains, and then suddenly a hoarseness. Examination of the larynx showed a complete paralysis of the left vocal cord and diminution of sensation on the left side of the larynx. The left pupil was slightly larger than the right. There was also an equivocal Babinski sign on the left, and questionable paresis of the right side of the face of central origin. The laryngeal paralysis improved gradually and disappeared completely three months after the onset.

In the following case, the serum reaction was characterized by involvement of the mucosa of the larynx rather than the laryngeal nerves. Taquino<sup>23</sup> reported the occurrence of laryngeal stenosis following the administration of tetanus antitoxin. The patient was a boy, age 13 years, who had received an injury for which tetanus antitoxin was administered in large doses over a period of about seven days. About a month after the last administration of tetanus antitoxin, the patient developed respiratory difficulty, which required tracheotomy. Examination of the larynx made about six weeks later showed a marked hyperplasia and thickening of the ventricular bands.

Harlowe<sup>24</sup> reports a case of procaine idiosyncrasy in which, following the injection of 0.5 per cent solution, the patient complained of faintness, severe headache, dyspnea and nausea. The patient became cyanotic, vomited, and developed a rapid and weak pulse, and then general clonic spasms began. The operation was not performed, but nine days later another physician injected a 1 per cent solution of procaine with epinephrine, and the patient expired on the operating table.

#### INCIDENCE OF ALLERGY OF THE NOSE AND PARANASAL SINUSES.

In a discussion of the conservative management of the sinuses, Jervey<sup>25</sup> considers, in brief, the most important phases of this problem. His statistics on the incidence of sinusitis and allergy are interesting. During the years 1924-1928, 421 cases of sinusitis and 11 cases of allergy were noted among 1,566 ear, nose and throat cases. From 1929 to 1933, there were 328 cases of sinusitis and 20 cases of allergy among 1,395 patients. From 1934 to 1938, there were 305 cases of sinusitis and 76 cases of allergy among 2,419 patients. Jervey stated that the diagnosis of sinusitis is gradually falling. Allergy

and other conditions (nutritional disturbances and traumatic rhinitis) are increasing. It is noteworthy that the percentage of allergic cases increased from 0.7 per cent during the first five-year period to 3.1 per cent during the last five-year period. According to our statistics<sup>26</sup> the incidence of allergy among ear, nose and throat cases is about 16 per cent, while among all nose and sinus cases it is about 40 per cent. The incidence of allergy in any individual private practice is proportional to the accuracy of the diagnosis of allergy.

That the rhinologist has become allergy-conscious in the diagnosis of sinus diseases is exemplified in many recent discussions of this subject. For example, Watkins<sup>27</sup> emphasizes that allergic phenomena are very common in nasal diseases and are likely to be overlooked unless careful history and examination are instituted. He further states that the failure to recognize the presence of allergy is responsible for lack of success in many operations on the nose. The relation of nasal polyps to allergy and the association of infection with nasal allergy were also discussed. The importance of the primary consideration of the allergic process before instituting operating procedures is advised.

According to the observations of Swann,<sup>28</sup> from 20 to 30 per cent of sinus disease is of allergic origin, and in cases of chronic disease the incidence of allergy is much greater. Any patient with a history of frequent colds, sneezing, itching of the nasal mucous membrane, nasal discharge and nasal obstruction, edema, and pallor of the mucous membranes should receive a thorough study to determine the possibility of the presence of nasal allergy.

In a general discussion of the subject of nasal allergy, Jay<sup>29</sup> calls attention to the diagnostic difficulties sometimes encountered in the recognition of these cases. The typical picture of a pale, boggy mucosa is not infrequently absent; therefore, a great deal of dependence must be placed upon an accurate clinical history. The nasal manifestations of allergy should always be considered when dealing with patients with frequent colds, catarrh and nasal obstruction. Jay emphasizes the importance of making a distinction among the following types of cases: 1. polyposis due to allergy, 2. polyposis due to infection, and 3. polyposis associated with allergy and infection. He adopts a conservative attitude toward surgery



and points out that patients selected for operative interference should be carefully selected. He places primary importance upon the recognition and treatment of the allergic process.

The matter of diagnosis and treatment of conditions simulating sinus disease was discussed by Slack.<sup>20</sup> He brings out the point that patients often complain of nasal symptoms, such as increased discharge, nasal obstruction, and headache which may be caused by some general systemic disorder or certain local conditions entirely unrelated to the paranasal sinuses. He further emphasizes that before instituting any therapeutic measure or advising operative procedures, it is absolutely essential that the patient be given a thorough medical examination and diagnostic study. Among various conditions which may commonly simulate sinus disease, Slack enumerates the following: neurasthenia, allergic conditions, infected teeth, refractive errors and eye strain, syphilis, intracranial conditions, disturbances of the endocrine glands, improper diet, undulant fever and encephalitis. In the diagnosis of allergic conditions in the nose, especially the atypical types, it is very important to determine absolutely whether or not an allergic condition exists, and it is well to bear in mind, therefore, that nasal disturbances may be present which simulate allergy but are caused by some local or general systemic condition which is in no way related to allergy.

#### ALLERGY AND UPPER RESPIRATORY INFECTIONS.

Although many reports have appeared in the literature on the incidence of primary and recurrent respiratory infections, very few observers have carefully excluded those cases with allergic reactions simulating infections. For example, in 1930, McLean<sup>31</sup> reported a group of 582 children with colds, and stated that 241 had one or more recurrent infections. Forty-seven of these patients were classified as having bronchitis of the asthmatic type, and 43 with spasmodic croup. There were 90 cases, therefore, in which allergy must have played a part. Although it was reported that contact with someone with a cold seemed to influence the incidence of primary infection, it had little, if any, relationship to the incidence of recurrent infections. As emphasized by Cohen and Rudolph,<sup>32</sup> conditions of the upper respiratory tract in children should be considered as being chiefly of three types; namely: 1. allergic, 2. infectious, and 3. combined allergic and infectious. The symptoms

in all three types of cases are frequently similar, and differential diagnosis frequently depends upon a careful study of the clinical and laboratory aspects of the case. In the accompanying Table I are listed the differential points between allergic and infectious conditions as suggested by Cohen and Rudolph.

TABLE I.—DIFFERENTIAL DIAGNOSIS OF ALLERGIC AND INFECTIOUS CONDITIONS OF THE UPPER RESPIRATORY TRACT IN CHILDREN.

HISTORY.	
ALLERGIC.	INFECTIOUS.
1. Attacks usually recurrent.	1. Attacks usually single.
2. Often mild symptoms between attacks.	2. Usually clears up completely.
3. Definite relation to heredity.	3. No relation to heredity.
4. Not contagious.	4. Contagious.
5. Not related to exposure to another case.	5. Definite relation to exposure to another case.
6. Constitutional symptoms slight.	6. Constitutional symptoms more marked.
7. Foods and inhaled substances often traced as causes.	7. No relation to foods or inhaled substances as cause.
8. Itching common.	8. No itching.
9. Wheezing common.	9. No wheezing.
10. Other allergic conditions present or in past history.	10. Usually no other allergic condition present or in past history.
EXAMINATION.	
ALLERGIC.	INFECTIOUS.
1. Visible mucous membranes, pale, glistening, edematous.	1. Visible mucous membranes, hyperemic, red.
2. Thin, watery, mucoid nasal discharge, mucoid sputum.	2. Mucopurulent or purulent nasal discharge or sputum.
3. Smear shows eosinophiles in large numbers.	3. Smear shows polymorphonuclear neutrophiles as predominant cell; eosinophiles few or absent.
4. Other signs of allergy often present.	4. No other signs of allergy.
5. Sinus involvement of edematous type.	5. Sinus involvement of purulent type.
6. Wheezing breath sounds.	6. No wheezing breath sounds.
7. Roentgenograms show bronchial markings increased.	7. Bronchial markings not increased in Roentgenograms.
8. Allergic skin reactions usually positive.	8. Allergic skin reactions usually negative.
TREATMENT.	
ALLERGIC.	INFECTIOUS.
1. Epinephrine specific for asthmatic symptoms.	1. No relief from epinephrine or ephedrine.
2. Avoidance of specific allergens followed by relief.	2. Avoidance of food or inhalant substances produces no change.

The combined allergic and infectious type is frequently difficult to diagnose, especially in the acute stage. Repeated

observations with determination of the cytology of the secretions may be necessary before the allergic factor can be definitely evaluated.

Since the clinical picture of acute rhinitis and acute paranasal sinusitis is well known, only a brief consideration of this phase of the subject is necessary. Attacks of acute rhinitis usually run a typical course, lasting from five to 12 days, after which there is usually an immunity lasting several weeks, or, if the attack is uncomplicated, there is a complete resolution of the process. There is generally a history of physical exposure or of contagion. The attack is accompanied by fever, malaise and other well known symptoms. The onset is not related to food or inhalant contacts. The examination of the nose shows a swollen, usually hyperemic membrane with mucopurulent secretion which shows the presence of numerous pus cells. Roentgenograms of the sinuses are not often significant. When acute rhinitis does not undergo resolution within a reasonable period of time, however, a complicating sinusitis usually manifests itself with the symptoms of persistent mucopurulent discharge, positive Roentgenographic findings and general symptoms of infection. In chronic paranasal sinus infections, it is particularly important to differentiate between allergy and infection and to take into consideration that an existing chronic infection may be associated with an allergic process.

In a study of 455 consecutive allergic patients, Bernton<sup>33</sup> encountered 71 who claimed that a cold was responsible for their asthmatic seizures. Twenty-seven of the patients were age 10 years or under. In this connection, the value of the cytologic study of the nasal and bronchial secretions should be emphasized in making an accurate diagnosis in these cases, otherwise it is not infrequently difficult to differentiate between an allergic exacerbation and an acute infection.

Clarke<sup>34</sup> emphasizes the importance of early diagnosis of allergic disease in the respiratory tract. He points out that in children before dyspnea begins there are usually prolonged premonitory symptoms, such as sneezing, blocked nose, mouth-breathing, cough or coryza. The acute attack of dyspnea is often the first incident that calls the attention of the family and the physician to the allergic nature of the ailment. The plea is made for treatment of early preasthmatic symptoms,

emphasizing the fact that the majority of these children do not develop asthma if the early minor symptoms are treated. Attention was called to the rather frequent history of the onset of asthma after tonsillectomy. In these children with nasal symptoms, diagnosis can be easily established by the finding of an eosinophilia of the nasal secretions. In the event that a child suspected of having nasal allergy should have an acute rhinitis, the nasal secretions may show only neutrophils. In these instances, repeated examinations of the secretions should be made, especially after the acute infection has subsided.

The relationship of sinusitis allergy and the common cold were discussed by Sewall,<sup>35</sup> who calls attention to a number of important points in bacteriology and pathology. Acute infectious rhinosinusitis, chronic infectious rhinosinusitis and chronic hyperplastic rhinosinusitis were all considered from these viewpoints. The importance of distinguishing the nasal manifestations of allergy from these various types and the recognition of combined forms of allergy and infection were emphasized.

In discussing the matter of allergy in relation to colds and coughs, Clein<sup>36</sup> brings out the point that children presenting the symptoms of frequent colds and chronic coughs are frequently subjected to various forms of treatment without results, such as removing the tonsils and adenoids, cold shots, Vitamin D products, light treatments, sinus treatments and climatic changes. It is emphasized that in the diagnosis of acute and chronic rhinitis, croup, paranasal sinusitis, laryngitis, tracheitis, bronchitis, the possibility of allergy must be considered. In children, acute and chronic infections may obscure a primary underlying allergic condition.

Persky<sup>37</sup> made an investigation of the causes of rhinorrhea in children, especially in those who had already had the tonsils and adenoids removed. Especial reference was, therefore, made to those children who gave a history of frequent colds and nasal discharge and who continued to have these symptoms after the tonsils had been removed. It was noted that certain systemic conditions may have a direct influence in these children. Reference was made to syphilis and other hereditary stigmata. In the malnutritional or marasmic group of cases, it was noted that frequent colds continued because of

a lack of proper attention to this factor. Tuberculosis, diabetes, rickets and other conditions were also considered in this group. Treatment to combat the nutritional factor was advocated. Another group of cases was considered as of the lymphatic or endocrine type; often complicated by such conditions as otitis media, asthmatic bronchitis, rheumatism and nephritis. Finally, attention was called to the importance of proper diagnosis and treatment of the allergic type of nasal disturbances. The importance of the recognition of complicating infection was also stressed. Various types of local treatment were also recommended. In all children with rhinorrhea, regardless of whether they fall into any of the above-mentioned groups, the possibility of the nasal manifestations of allergy should always be carefully considered.

#### ALLERGY AND TONSILLECTOMY.

In all children on whom a tonsillectomy and adenoidectomy are to be performed, especially those who give a history of frequent colds, sinusitis or bronchitis, the possibility of allergy of the respiratory tract should be considered. By the careful correlation of the allergic history, nasal and cytologic findings, we found that among children giving the above history there is a significant number who have active respiratory allergy. Among 200 routine cases considered for removal of the tonsils and adenoids, we<sup>28</sup> found that 26, or 10 per cent, of the children had definite respiratory allergy. These cases are easily overlooked. When this problem is considered from a national standpoint, it is evident that this is a matter which deserves serious consideration. Tonsillectomy certainly should not be performed unless it is necessary, and if advisable should not be done during any hay fever season. Tonsillectomy rarely has any distinct beneficial effect on respiratory allergy but may reduce the incidence of complicating infections. Large, obstructing tonsils and adenoids should be removed in allergic children because nasal respiration is already impaired.

The relative value of tonsillectomy in allergic children has been presented in a recent report by Waldbott and his associates.<sup>29</sup> In a group of 1,112 patients with hay fever and asthma, studied by them, tonsillectomy was performed in 228 before the onset of allergic symptoms, and in 205 after allergic manifestations had developed. In the latter group, definite relief occurred in 1.9 per cent, temporary relief in 1.9 per

cent, and aggravation of allergic symptoms occurred in 11.6 per cent. In a control group of 60 patients subjected to tonsillectomy after they had been under observation, the results were about the same. When tonsillectomy was performed for conditions other than allergy, it was successful in 35.2 per cent of the allergic group, and in 36.4 per cent of the pre-allergic group, as compared with 72 per cent improvement recorded in normal controls (Kaiser). Among 228 patients subjected to tonsillectomy before the onset of allergic symptoms, 14.4 per cent developed allergic manifestations within three months, 29.3 per cent within six months, and 48.6 per cent within two years after the operation. This compares with 26 per cent showing frankly allergic symptoms within three months; 47 per cent within six months, and 63 per cent within two years. In the patients whose tonsils were removed for the relief of nasal colds and bronchitis, tonsillectomy was of more benefit in the earlier age groups. The operation was less successful when performed during the pollen season. Although the results of tonsillectomies were disappointing, the authors believe that tonsillectomy should be performed in patients having frequent infections. In others with allergic catarrh of the upper part of the respiratory tract, which may or may not involve the tonsils, they believe that tonsillar tissue is a definite asset to the system and should be preserved.

#### TREATMENT OF NASAL ALLERGY.

Although inhalants play an important part in the etiology of nasal allergy, foods may also act as excitants. Eyerman<sup>40</sup> reports his observations on a group of 181 patients in whom the deliberate ingestion of food induced nasal obstruction, coryza and sneezing. From his observations, he concludes that multiple skin and clinical sensitivity are the rule rather than the exception, and that skin sensitivity is not an unerring guide to clinical sensitivity. He found that the foods most frequently eaten as the ones most likely to induce attacks of nasal allergy. Frequently, food and inhalant avoidance is sufficient to bring about a satisfactory therapeutic result. He emphasizes that in patients with perennial nasal allergy and hay fever, avoidance of food and inhalants other than pollen usually brings about a satisfactory therapeutic result. He found that when bronchospasm complicates the allergic reaction in the nose, inhalants are more likely to be the dominant

causative agents. Before determining that pollen injections are imperative, one should consider the clinical influence of foods and inhalants other than pollen. In many of these cases he feels that the persistence and duration, and possibly the initiation and intensity, of symptoms depend upon the total allergic dose.

In the management of nasal allergy it is difficult to explain the discrepancy in various reports of the evaluation of the causative factors in these cases. For example, in the following presentation, food was not found to be the sole factor in a single case.

Windenwerder and Gay<sup>41</sup> report an analysis of 198 cases of perennial allergic rhinitis encountered in private practice. They found that nasal allergy occurs in all age groups, being most common in young individuals, especially before the age of 10 years. During the first decade, males predominated but after this period the disease was more frequently encountered in females. It seems rather unusual that only 12 out of 100 patients showed a blood eosinophilia. Approximately 25 per cent of the cases were associated with bronchial asthma; 20 per cent with hay fever; 5 per cent with eczema; and 3 per cent with urticaria. In less than 2 per cent, food sensitivity was demonstrated. About 50 per cent of the associated allergic disorders appeared during the first decade. It was stated that dust, feathers and orris root, singly or in combination, accounted for 95 per cent of the etiologic factors in the cases in this series. Animal danders, kapok and cottonseed accounted for the remaining 4 per cent. It is noteworthy that the observers failed to find a single case in which food was the only causative factor. One hundred and thirty-seven patients were treated by avoidance of the offending factors and by desensitization with specific extracts. In 82 per cent, the patients were completely cured or markedly improved; in 18 per cent, they remained unimproved. Of 22 cases in this series that showed coexisting infections of the sinuses or tonsils, 11 cleared up following allergic management, while nine required surgical treatment.

In the diagnosis of nasal allergy from the standpoint of the otolaryngology, a great deal of emphasis should be placed upon a complete investigation of the local condition. In treatment,



the recognition and attention to other associated manifestations of allergy should not be overlooked.

In discussing the diagnosis of nasal allergy, Hansel<sup>42</sup> emphasizes a careful analysis of the nasal symptoms and repeated cytologic examinations of the nasal secretions for eosinophiles. Further emphasis is placed upon the correlation of the cytologic picture, with the X-ray and bacteriologic findings. Attention is also called to the importance of recognizing acute and chronic infections as complications of allergy in the nose and paranasal sinuses. In the complete analysis of patients with nasal allergy, attention should also be directed to the association of other manifestations of allergy, such as gastrointestinal allergy, allergic headache and the various types of skin allergy. The various types of allergy of the nose and paranasal sinuses, with their pathologic changes and their association with other manifestations of allergy are illustrated in 10 case reports.

The pathologic changes in the nose and paranasal sinuses in allergy may be of the reversible or irreversible type. Reversible changes are those which disappear with the control of allergic symptoms. Acute or subacute edema in the form of polyposis, which may occur in the nose and sinuses in hay fever, almost invariably disappears at the termination of the hay fever season in purely seasonal cases, provided that complicating infection has not developed. In hay fever patients with perennial symptoms, these changes may persist, depending somewhat upon the degree of allergic reactivity.

In the usual perennial cases, reversible or temporary edema may coexist with irreversible or permanent edema. Until allergic management has been effective in controlling the symptoms, it is therefore impossible to evaluate the relative degree of these two types of pathologic change. Finally, those cases with permanent changes or fixed edema, with cystic degeneration and superimposed infection which undergo little change under allergic management, represent the types that should be subjected to radical surgical procedures.

It has been estimated that the average incidence of polyposis among all types of nasal allergy is about 25 per cent. The approximate percentage of the reversible and irreversible types has not as yet been determined. This can be accom-

plished only by close co-operation of otolaryngologist and allergist. In all patients subjected to surgical interference, histopathologic findings should be correlated with all other data.

#### DRUGS IN TREATMENT OF NASAL ALLERGY.

In the treatment of infection of the upper respiratory tract, Parkinson<sup>43</sup> recommends the use of the lateral head-low posture while introducing ephedrine in saline solutions into the nose. This is a most efficacious method of producing a shrinkage of the ostia of the sinuses, and hence the establishment of drainage of secretion. The method is also useful in the treatment of nasal allergy in those instances in which local shrinkage is necessary. This treatment is particularly applicable in children.

In 44 instances of various allergic conditions, such as asthma, urticaria and pollen asthma, Boyer<sup>44</sup> investigated the use of propadrine hydrochloride. Four patients stated that the propadrine was inferior to other forms of medication, especially ephedrine. Five felt that propadrine was equally efficacious to previous medication, and 35 patients reported their greatest symptomatic improvement occurred from this drug. Clinically, bronchospasm and rhinitis were relieved. There were no side reactions so commonly encountered in the administration of ephedrine. Marked relief, therefore, was obtained without the usual nervousness and insomnia which may follow ephedrine. It was not found necessary to administer sedatives with propadrine hydrochloride.

Vollmer<sup>45</sup> has made an investigation of the use of the benzedrine inhaler in acute colds, sinusitis and allergy in children. The idea of the investigation was to determine the feasibility of administering benzedrine to children by dry inhalation, the therapeutic effect of such inhalation, and the possible occurrence of toxic effects. It was used in 75 cases of acute rhinopharyngitis and sinusitis with relief of the obstructive symptoms. In asthma, the nasal obstructive symptoms were definitely relieved. No untoward effects were noted from the use of the inhaler.

Fenton and Larsell<sup>46</sup> carried out a series of experimental and clinical studies on several substances resembling ephedrine. In a considerable series of private patients, the effects

of these substances on the interior turbinate were tested by swabbing on a 1 per cent solution, and in a smaller series the solution was dropped into the nose with the head reversed, with the following results: Tetrandrine methiodide in a 1 per cent and in 0.5 per cent solution produced a pinkish precipitate at room temperature after 24 hours; hence, it was used only a few times. Shrinkage was rather marked, but complaints were made of its bitter taste and tendency to produce slight burning. Hordenine methiodide in a 1 per cent solution produced fair shrinkage, slight sneezing and burning, and a rather persistent bitter acid taste. Benzyldimethylamine methiodide in a 1 per cent solution gave an excellent shrinkage with little or no burning, but was slightly bitter. Betaphenylethylamine in a 1 per cent solution produced fair shrinkage with slight burning and a fairly bitter taste. No evidence of systemic absorption or of changes in pulse or blood pressure was noted.

The value of these substances would seem to lie in their clinical use in relatively acute conditions, after determination of necessary pharmacologic factors, particularly for benzyldimethylamine methiodide and betaphenylethylamine.

According to the investigations of Fitzhugh,<sup>47</sup> neosynephrin is chemically related to epinephrine and ephedrine. He found neosynephrin hydrochloride superior to epinephrine hydrochloride and ephedrine hydrochloride as a cardiovascular stimulant. It is as good, but superior to, epinephrine hydrochloride in increasing the efficiency of infiltration anesthesia. It is less toxic than epinephrine hydrochloride or ephedrine hydrochloride. produces constriction of longer duration than that produced by ephedrine hydrochloride and there are no apparent undesired effects.

Of 26 carefully selected and studied cases of vasomotor rhinitis, Prickman<sup>48</sup> noted definite relief from the use of histaminase in nine, or 34 per cent. In four instances the results were questionable; in the remaining 13 no relief whatsoever occurred. In those patients who obtained relief, the administration of the drug had to be continued as it did not appear to produce desensitization.

Riegele<sup>49</sup> reports favorable results in the treatment of vasomotor rhinitis by the intracutaneous injection of a mixture

of cresol free from protein. Wheals were induced at two-day intervals until from six to eight were made. This form of nonspecific shock therapy was effective in some instances in which other measures had failed.

Griebel<sup>50</sup> reports satisfactory results in uncomplicated cases of vasomotor rhinitis by treatment with spleen extract. With the improvement of symptoms there was a disappearance of blood eosinophilia. In chronic cases of hay fever and of bronchial asthma with no eosinophilia, it was possible to produce it by means of subcutaneous injections of spleen extract, although a reduction of symptoms occurred. It is believed that spleen extract exerts a regulating influence on the eosinophilopoiesis of the bone marrow.

#### ESCHAROTICS AND IONIZATION IN NASAL ALLERGY.

With the introduction of ionization as a treatment for nasal allergy, interest was also stimulated in the use of escharotics, astringents and other agents.

Abramson<sup>51</sup> reports his experiences with the use of tannic acid therapy in allergy of the nasal mucosa. He uses a solution of 0.5 per cent tannic acid, which the patient sprays into the nose with a glass nebulizer two or three times a day, depending upon the reaction. In some instances the tannic acid solution causes too much irritation and therefore must be used only in selected cases.

For those cases of nasal allergy refractory to other methods of treatment, Fishop<sup>52</sup> recommends the use of injections of sodium morrhuate into the inferior turbinates. After cocaineization of the mucosa, 0.25 to 0.5 cc. of 5 per cent solution of sodium morrhuate is injected between the periosteum of the turbinate and the overlying mucosa. Injections may be given at several points in the turbinates at the same time. Small amounts of fluid are injected at each point. The technique and results obtained were illustrated in seven case reports. On the whole, the results obtained were considered most satisfactory.

Bernheimer<sup>53</sup> made a study of the clinical results obtained by ionization of the nasal mucosa in a group of 25 individuals with hyperesthetic rhinitis and 10 with seasonal hay fever, as compared with a similar group treated by the use of escha-

rotics. The observations extended over a period of 15 months. It is noteworthy that two patients suffering from hyperesthetic rhinitis developed anosmia following ionization treatment, which persisted for four and seven months, respectively. In another instance a neuritis of the nasal ganglion, with the typical pain syndrome described by Sluder, persisted for three and one-half months. No complications were noted following the use of escharotics.

From these studies it was concluded that the histologic effects of ionization do not differ from those resulting from the application of escharotics. In neither was there marked evidence of fibrosis. It was found that the clinical course of hyperesthetic rhinitis was influenced in only 5 per cent of the 25 patients who were treated with ionization. Slightly better results were obtained with escharotics. The clinical course of hay fever was not altered by the use of either method. Finally, it was stated that ionization of the nasal mucous membrane may be followed by complications which do not occur with the use of escharotics.

The effect of intranasal phenol application was studied by Vistreich<sup>54</sup> in 28 consecutive cases of early and late hay fever. The technique of this procedure was described in detail. It was stated that the treatment was not followed by stormy reactions or long convalescence. The results were reported as follows: 90 to 100 per cent relief was obtained in 72 per cent of the cases; 75 to 90 per cent relief in 8.3 per cent; 50 to 75 per cent relief in 12.5 per cent of the cases; and no relief in 4.2 per cent. By means of intranasal swab tests with serial dilutions of pollen extracts, it was noted that the treatment produced an actual decrease in the sensitivity of the nasal mucosa to pollen. By periodic testing it was found that this state of relative insensitiveness is not permanent. The average duration observed in this group of cases was approximately seven to eight weeks. This form of treatment was recommended as a palliative procedure in those patients with hay fever presenting themselves for treatment during the season; also in patients who previously had had unsatisfactory results from allergic treatment. It was also recommended for those patients who do not tolerate well the hypodermic injections of pollen extracts.

Lewy<sup>55</sup> recommends the local use of resorcinol. He states

that the proportion of successes has been considerably greater than with any other treatment and the reaction less. Resorcinol is applied in the form of a watery paste over the entire nasal mucosa, including the middle meatus, after a preliminary application of 3 per cent cocaine. He found that relief from this treatment may last for a few weeks to several months, and in a number of cases treated about two years ago there has so far been no recurrences. Its use in the treatment of ragweed hay fever has not been encouraging.

Wenner and Alexander<sup>56</sup> reported some very interesting observations on the effect of zinc ionization and galvanic current on the reactions of the nasal mucosa to vasomotor drugs. Their experimental studies showed that changes in the nasal mucosa following zinc ionization do not hinder the absorption of vasomotor drugs instilled into the nasal cavity. The blood vessels and the cavernous tissues of the nasal mucosa fail to react to vasoconstrictors and vasodilator substances for six weeks after zinc ionization and four weeks after treatment with the galvanic current. It is believed that this failure of the vascular structures to constrict or dilate is due to a temporary paralysis of the vasomotor nerves or to a loss of vascular tone. Histologic studies of the blood vessels, however, showed no thickening or other pathologic change in the wall of these structures that might account for this temporary disturbance of the vasomotor mechanism.

A recent report by Alden<sup>57</sup> on ionization of the nasal mucosa in allergy summarizes his observations to date. He states that certainly desensitization is still the method of choice in the treatment of nasal allergy, with ionization being reserved for those cases where the obstructive and secondary symptoms are predominant and where the mechanical relief to be expected is more than commensurate with the tissue damage incident to ionization. He found that asthma was not lessened after ionization except in a few cases. He finally concludes by stating that ionization produces in the nasal mucosa mechanical changes which render it less susceptible to vascular and secretory reactions. He does not believe that ionization alters either the allergic status of the individual or the ability of the nasal cells to be affected by allergens. Finally, he points out that the value of ionization rests solely upon its efficiency as an agent to reduce excessive nasal intumescence, and hypersecretion.

The results obtained in nasal ionization in 72 cases of hay fever were reported by King.<sup>58</sup> Among 24 patients with autumnal hay fever, four had complete relief, nine were improved and 11 had no relief. In 19 patients with spring hay fever, five had complete relief, 10 improvement and four no benefit. Among 32 patients with perennial nasal allergy, six were relieved, 14 were improved and 12 had no relief. In summarizing the entire group, it is significant that 15 patients had relief, 33 improvement and 27 no relief.

In a further report on the use of ionization in the treatment of hay fever and hyperesthetic rhinitis, Bryant<sup>59</sup> gives a tabulation of a small group of cases which were carefully followed. On the basis of the results obtained during the past year, as well as the further observation of patients treated a year ago, and in spite of the fact that at the time of his first report he expressed a note of caution about becoming too enthusiastic too early in the use of the new method of treatment, he feels highly enthusiastic about the Warwick ionization treatment for hay fever and kindred conditions. He feels that it is deserving of wider interest on the part of general practitioners who are seeking relief for their patients from these conditions and wider knowledge and use on the part of properly trained otolaryngologists, in whose hands this procedure safely and wisely belongs.

Hollender<sup>60</sup> reviews 150 cases and states the result is a prolonged symptomatic palliation, gratifying to both patient and rhinologist. The results in seasonal hay fever were disappointing, but he states that further research will be required before we can accept as final the reports which thus far have been placed on record. He concludes that zinc ionization is a simple and safe procedure in suitable cases of perennial vasomotor rhinitis and in asthma associated with vasomotor rhinitis and should be given a fair trial when conservative measures have failed.

Barrett<sup>61</sup> states that this form of treatment is good in some cases, of much value in others, and without benefit in the rest, but he feels that it will take considerably more investigation over several years before its true worth will be known.

The use of ionization in the treatment of hay fever and hyperesthetic rhinitis was also reported by Hurd.<sup>62</sup> Hurd



uses the technique of flooding the nose with the electrolyte instead of introducing it on cotton strips. He reports that over 70 per cent of the patients with hyperesthetic rhinitis became symptom-free after treatment, and that in the hay fever cases symptoms disappeared immediately after ionization in almost all instances.

According to the experiences of Shields,<sup>63</sup> nasal ionization with zinc sulphate is a valuable method of treating hay fever and vasomotor rhinitis. Shields showed that the effect produced by ionization is due to the impregnation of the mucous membrane with zinc in ionic form. In four patients with hay fever, ionization with sodium chloride instead of zinc solution was instituted. No improvement in the patient's symptoms followed this procedure.

The principle of ionization as used in the nose, but with modifications of the technique, has also been employed in the treatment of various conditions of the conjunctiva and lids. Erlanger<sup>64</sup> reports his results with this procedure, stating that the ionization makes the drugs more effective by increasing the permeability of the tissues. Such conditions as follicular conjunctivitis, catarrhal ulcers of the cornea, ulcerative keratitis, trachomatous keratitis, episcleritis and scleritis were treated with very satisfactory results. Various electrolytes, such as zinc sulphate, calcium chloride, quinine hydrochloride, histamine and acetylcholine were used.

Hollender and Fabricant<sup>65</sup> present a very comprehensive histologic study on the nasal mucosa following nasal ionization. No histologic evidence has been produced to prove that nasal ionization is a harmful therapeutic procedure. They concluded that the evaluation of this procedure should be based solely on clinical observation until more conclusive histologic evidence of the effects of nasal ionization is available.

From a review of the current literature, Hansel<sup>66</sup> summarizes the status of ionization in nasal allergy. On the basis of this review, the following conclusions were drawn. According to the observations of many leading rhinologists, ionization of the nasal mucosa is considered a safe and satisfactory measure in the treatment of hay fever and perennial nasal allergy. On the other hand, the observations of several leading allergists indicate that ionization does not give results comparable

to those obtained by allergic methods of treatment. Several observers have shown that the use of escharotics in nasal allergy will produce results equally as satisfactory as those obtained by ionization. So far, no permanent destructive changes have been noted as a result of ionization. Complications, such as anosmia, neuralgia and sinusitis, however, have been reported in a few cases. Satisfactory relief following ionization is apparently the result of a general desensitizing effect, as well as a shrinkage of the nasal tissues and the diminution of hypersecretion. It was emphasized that accuracy in diagnosis in all patients subjected to the various types of treatment discussed is essential in order to eliminate errors in the compilation of results on a statistical basis. It is generally concluded that ionization in nasal allergy should be confined to those cases in which allergic methods of treatment have failed to give satisfactory relief of symptoms. The selection of cases for this type of treatment, therefore, should be made by the close co-operation of the allergist and the rhinologist.

#### ALLERGY AND SURGERY OF THE NOSE AND PARANASAL SINUSES.

Haiman<sup>67</sup> attributes failure of surgical treatment in diseases of the sinuses to an underlying allergy. He reviews the possible etiologic factors, also calling attention to the possible part played by endocrine gland disturbances. He feels that these patients should be treated primarily on an allergic basis and that operations on the sinuses should not be performed unless frank suppuration of the sinuses is present.

Clarke and Rogers<sup>68</sup> report a statistical study of 162 cases of allergic or vasomotor rhinitis. It is noteworthy that 73 per cent of the patients had already had one, and 20 per cent had two or more operations on the nose and throat. Fifty-one per cent showed positive skin reactions to one or more inhalants, although in only 10 per cent were the reactions markedly positive. All tests were done by the intracutaneous method. This series of patients did not include patients reacting to pollen. House dust was found to be the most frequent cause of reactions, producing positive reactions in 75, or 46 per cent, of the entire series. Next in frequency were feathers and orris root. There were only seven reactions to food.

In discussing the matter of indications for radical sinus surgery, McLaurin<sup>69</sup> expresses the following opinion regarding chronic hyperplastic sinusitis with polypoid formation. He believes that the presence of these conditions is a definite indication for radical surgery. At the same time, he believes that allergic therapy should be carried out. Regardless of the type of surgery employed, he does not expect much permanent benefit unless general measures directed toward relieving an essential allergic tendency are carried out. Attention is called to the former belief that hyperplastic changes in the sinuses were primarily of infectious origin. He emphasizes now, however, that these conditions should be considered primarily of allergic origin with few exceptions. In some cases of hyperplastic ethmoiditis with polyps, only the removal of polyps, with proper control of the allergic state, is advised. The presence of secondary infection, however, McLaurin believes, is an indication for radical types of sinus surgery.

The surgical indications in disease of the nasal sinuses due to allergy were discussed by Mullin<sup>70</sup> and several illustrative cases were presented. His observations were based on a study of 216 patients. In this group it was noted that operations had been performed in 52 instances with no relief of symptoms, and no studies to determine the presence of allergy had been made. Mullin found it necessary to perform the same operations after an allergic condition was diagnosed and eliminated in only 15 instances. It is obvious that if operation had yielded relief, these patients would not have sought further treatment. In this group of patients, therefore, careful studies to determine allergic sensitivity might have eliminated more than two-thirds of the nasal operations to which they were subjected. According to Mullin's experience, allergy is a complication in between 30 to 35 per cent of the cases of chronic disease of the nasal sinuses. These observations of Mullin emphasize the importance of primary allergic studies in these patients and the necessity of conservative surgical procedures. The report is very instructive and should be read by everyone interested.

In an analysis of a group of sinus cases from the standpoint of pathology, diagnosis and treatment, the chief types to be considered are the allergic, the pure infectious and the combined allergic and infectious. A great many analyses of sinus

cases still appear in the literature without any consideration of allergy whatsoever. For example, Syme<sup>71</sup> analyzes a group of 100 consecutive cases of antrum disease which were operated upon by the radical Caldwell-Luc method. The chief symptoms in these cases were nasal obstruction, headache, postnasal discharge, sore throat and anterior nasal discharge. Chronic cough and asthma were considered among the associated conditions. No histopathologic, bacteriologic or cytologic studies were made in these cases. The pathologic conditions found in the antrum were as follows: mucous membrane edematous, 19; mucous membrane thickened, 13; pus present, 25; polypi present, 52; alveolar abscess, two; atrophic membrane, one; and suspicious malignancy, one. It is clearly evident that there is a very high incidence of allergy in this group of cases, as indicated by the large number in which edema and polypi were found.

Mitchell<sup>72</sup> submits a report of his experiences in the management of sinusitis in children, extending over a period of 20 years. Among a group of 145 patients, 74 have been observed up until the present time. An additional 26 were kept under observation for five years, and 18 were followed for three years. All these patients had chronic sinusitis.

Mitchell emphasizes the importance of the consideration of allergy in the diagnosis and treatment of sinus disease in children. He states that many of his failures were due to the fact that he did not recognize and properly treat a complicating allergic condition.

#### PATHOLOGY OF ALLERGY AND INFECTIONS OF THE SINUSES.

In a very comprehensive presentation, Semenov<sup>73</sup> discusses the surgical pathology of nasal sinusitis, based on a group of 500 surgical cases. Microscopic examination of the mucosa showed that when thickening in excess of 2 mm. is present, it is associated with deep-seated degenerative changes in 50 per cent of the cases. Of the 500 cases, Semenov classified 72 per cent as purulent sinusitis, and 28 per cent as nonpurulent hyperplastic polypoid and cystic degenerative. Manifest allergic sinusitis occurred in 17 per cent; 35.4 per cent were classified as equivocal allergic cases. These latter cases were considered as latent allergic conditions in which the history was uncertain, vague or incomplete, but in which microscopic

examination showed tissue eosinophilia, associated with other histologic findings sufficient to warrant a presumptive diagnosis of latent allergy. Nonallergic inflammation as determined by careful history and examination and histologic preparations was present in 47.5 per cent of the cases. Degenerative changes were more pronounced in allergic sinusitis. He states that hyperplastic sinusitis, especially the bilateral type, is allergic in 70 per cent of the nonpurulent cases.

Tissue cultures revealed a preponderance of streptococci and staphylococci in chronic sinusitis, mixed infection being present in 80 per cent. It was further found that exudative sinusitis usually responded to conservative treatment. Degenerative changes which are irreversible in character required radical treatment. A study of postoperative healing in the paranasal cavities showed that it is accomplished by the formation of a dense layer of white, fibrous connective tissue which epithelizes by an ingrowth of nasal mucosa.

#### THE SINUS AND ASTHMA.

The incidence of sinusitis and nasal polypi in bronchial asthma was studied by Kelley.<sup>74</sup> His report was based on an investigation of 100 cases of bronchial asthma. According to X-ray examination, 89 per cent of the 100 patients showed a chronic hyperplastic sinusitis involving one or more of the sinuses. The remainder, or 11 per cent, showed no evidence of change. Sixty of the 89 patients with chronic hyperplastic sinusitis presented allergic nasal membranes; 23 of these patients were found to have nasal polypi. Kelley found that antral lavage revealed that in those cases with definite allergic reactions of the nasal membranes, the mucus content of the washings was relatively increased over that which was observed in cases with so-called simple hyperplastic membranes.

Harbert<sup>75</sup> calls attention to the diversity of opinion among various observers on the subject of sinusitis and asthma. He believes that the differences reported are due to an absence of control series of cases, accuracy in diagnosis, standardization of cures, observation over an insufficient period of time and, finally, failure to consider the allergic process as the primary factor. He calls attention also to the high incidence of positive Roentgenographic evidence of sinus disease in these cases.

He properly emphasizes that these changes are not an indication for operation but merely represent varying degrees of sinus edema. He favors the conservative methods of treatment, paying particular attention to the allergic state, and later considers whatever surgical procedures are necessary.

A study of the frequency of nasal lesions in asthma and the value of operations on the nose in such cases was reported by Jacquelin and Chait.<sup>76</sup> Four hundred and thirty patients were studied. In 48 cases the nose was found to be obstructed, and in 26, infectious manifestations, such as rhinitis and sinusitis, were noted. Various operative procedures, such as irrigations of the sinuses, resection of the septum, etc., were undertaken. On the whole, while the condition of a small number of patients improved, many showed no amelioration and several even became worse. It was concluded that asthma in itself is no indication for nasal operation.

Fox and Harned<sup>77</sup> report their observations on the treatment of asthmatic patients in otolaryngologic practice. Various surgical and nonsurgical procedures were carried out. One hundred and fifty private and clinic patients were included in each group. Among those treated surgically, only radical procedures were performed. Forty patients received the benefit of complete exenteration of all sinuses. Forty had intranasal radical ethmoidectomy and Caldwell-Luc operation on both sides. Fifty had only intranasal radical ethmoidectomy, and 20 with suppuration had one or both antrums operated on by the Caldwell-Luc technique. In summarizing the results from surgical treatment, it was stated that among the patients whose sinuses were totally exenterated, 60 per cent were cured; when only bilateral ethmoidectomy and exenteration of the antrums was done, 45 per cent were clinically cured; when ethmoidectomy alone was done, 32 per cent were cured, and when one or both antrums was exenterated in suppurative cases, 60 per cent obtained five-year relief. In addition to these, 34 patients, whose age or other conditions made them poor operative risks, received the benefit of only removal of polyps or other minor surgical treatment plus irradiation. In only three of these patients, or 9 per cent, was a five-year cure obtained. In the nonsurgical group of 150 patients, 16 adults with pronounced changes in the chest were given injections of iodized poppy-seed oil without other treat-

ment. None remained free from asthma longer than six weeks after treatment was terminated. It is noteworthy that subsequent Roentgenograms revealed the presence of Roentgen opaque material as long as two years after this treatment. In a second group of 24 patients, treatment consisted of instillation of autogenous antiviral into the chest. Four, or 16 per cent, were entirely free of asthma for nine months or more, the longest period being 13 months. Twelve, or 50 per cent, were free from asthma for six months, and the rest had freedom from asthma for from two to five months. A third group of 10 persons was given injections with material taken from asthmatic patients during operation. Because of the development of abscesses following the injection of this material, it was discontinued. Another group of 10 patients was given injections of serum taken postoperatively of persons with sinusitis and asthma. Of these patients, only three were free from asthma from six to 10 weeks. Seventy-five patients were given injections of pseudoglobulin. The results with this material, on the whole, were reported as good.

In a discussion of bronchial asthma and nasal allergy, Ramirez<sup>78</sup> considers the relationship of the pathologic changes in the nose and paranasal sinuses to asthma. He states that the exact relationship between nasal and sinus findings in asthma are often difficult to determine. Although they may bear no relation to each other, on the other hand, he believes that both may be of allergic origin and caused by the same allergen as in pollen asthma associated with hay fever; furthermore, they may be due to entirely unrelated substances. In the diagnosis of allergy, Ramirez emphasizes the necessity of a complete and carefully taken history, thorough physical examination, complete laboratory and Roentgen analysis, as well as tests of sensitization.

As far as treatment is concerned, Ramirez places importance upon allergic management and then to possible surgical interference in the nose and paranasal sinuses when the pathologic conditions appear to be definitely related to the asthma.

The relationship of pathologic changes in the nose and paranasal sinuses to bronchial asthma has been a much discussed subject. Some observers feel that the pathologic changes in both shock organs represent one and the same coexisting process and that the nasal and sinus changes do not



play an important part as the actual cause of the asthma. A few statistical studies of this relationship, particularly from the standpoint of surgical operations on the sinuses, have tended to substantiate the former viewpoint.

In a group of 13 cases of asthma subjected to pansinus operations, DeStio<sup>79</sup> reports that the asthma was cured in only three, or 23 per cent. The condition of three other patients was definitely improved, although the asthma was still present. The remaining seven, or 54 per cent, showed absolutely no improvement; in fact, the asthma in a few was worse after the operation. The three patients free of asthma have been well for four years. The remaining patients have also been under observation for four years since the operation. A complete frontoethmosphenoidectomy with the Caldwell-Luc operation was done on both sides in every instance. All contents and mucous membrane of the sinuses, together with all removable diseased bone, were meticulously removed, yet DeStio does not believe that one could call the final result successful as far as the asthma is concerned. The patients whose asthma was relieved were predominately those who had recently acquired asthma and sinus disease, whereas those whose conditions were unimproved had involvement of long duration.

From these observations DeStio concludes that chronic hyperplastic pansinusitis is fundamentally caused by decreased resistance to bacterial invasion as a result of the presence of an allergic or sensitizing reaction of the mucous membrane of the sinuses, which is one phase of the general allergic constitution of the patient. He further believes that chronic hyperplastic pansinusitis is not the cause of asthma but that both are probably the result of the patient's allergic nature in a large majority of instances. Conservative intranasal operations in advanced chronic hyperplastic pansinusitis do not completely remove the sinus disease, although they may temporarily relieve the patient's symptoms of both sinusitis and asthma. DeStio finally states that if one is to hope for any considerable relief of asthma by the elimination of sinus infection, one must not delay until the sinus disease has reached its advanced stage.

In a group of 500 asthmatic patients, Weille<sup>80</sup> found sinusitis in 362. Two hundred and twenty-three patients had nasal symptoms which were noted almost equally in intrinsic and

extrinsic asthma. Sinusitis was slightly more common in the intrinsic group. Polyps were found in 211; deviated septum in 92; severe chronic tonsils in 35; and abscessed teeth in 84. Sinus operations were performed in 100 patients, of which 17 were intranasal antrum operations; 41 radical antrum; 30 intranasal ethmoids; five external ethmoids; and 17 sphenoids and external frontals. More or less improvement in the asthma was noted in 66 per cent of those having sinus operation. Improvement was the same in both intrinsic and extrinsic asthma. The higher percentage of improvement in asthma followed conservative nasal surgery rather than very drastic operations. Among 186 patients with chronic tonsillitis, 35 had tonsillectomies, and in 25 there was improvement in the asthma. Of 84 patients with abscessed teeth, 59 had the abscessed teeth extracted. Thirty-nine of these patients had improvement of their asthma. Among 36 patients subjected to bronchoscopy as part of the treatment, 12 were improved and three were cured. There were 290 patients who had no surgical treatment whatever, in spite of the fact that many had sinusitis, chronic tonsillitis or abscessed teeth. The proportion of good results in this group treated only medically was about the same as in the group treated surgically.

The rôle that surgery of the paranasal sinuses plays in the asthmatic child was investigated by Creasy<sup>81</sup> in a group of 60 children between the ages of 5 and 14 years. In five patients there was slight veiling or edematous changes shown in the X-ray plates. Eight of the cases showed membranous antritis. In 21 there was combined antritis and ethmoiditis. Of these 21 patients, seven had antritis and ethmoiditis on the left side, and in 14 the same process was on the right side. Five patients showed bilateral ethmoiditis with involvement of one antrum. Seven had bilateral antritis, six had bilateral antritis and ethmoiditis, and two had pansinusitis. It is significant that in this group of 60 cases there were three males to each female. The results were reported as follows: 15 patients were asymptomatic after two years; 33 were asymptomatic from one to three months. In three patients, no results were attributed to poor co-operation, and in six the degree of improvement was not stated. Among the complications of the surgical procedures, one patient had bilateral mastoiditis, one had scarlet fever with postscarlet mastoiditis,

one patient had pyelitis, and four had acute otitis media requiring myringotomy.

#### BRONCHOSCOPY IN ASTHMA.

The value of bronchoscopy in asthma and related clinical conditions was emphasized by Clerf.<sup>32</sup> He believes that bronchoscopy should be given a trial in the treatment of cases of bronchial asthma that do not respond to the usual methods. He found that the best results were obtained in patients with tracheobronchitis, excessive secretions or bronchial obstruction. He found vaccines obtained from the bronchoscopically removed secretions to be of value in bacterial asthma.

Stokes<sup>33</sup> calls attention to the symptoms of asthma as being an indication of a possible tracheal or bronchial obstruction secondary to and associated with the pulmonary lesions, and stresses the importance of bronchoscopy in cases of tuberculosis that present symptoms of asthma. He reports the case of a woman, age 39 years, in whom a diagnosis of chronic tuberculotracheobronchitis was made. There was a mural stenosis caused by a granulomatous hyperplasia of the mucosa. Stokes believes that cases of known pulmonary tuberculosis complicated by signs and symptoms of bronchial asthma should have the benefit of a diagnostic bronchoscopy before resorting to allergic investigation.

Various forms of pulmonary atelectasis in children are described by Bruin and Gerlings.<sup>34</sup> Attention is called to the physical and radiological signs by which this affection can be diagnosed with more or less certainty. The desirability of early diagnosis is indicated by the fact that within a very short time irremediable changes can take place in the occluded lung field, by which the development of bronchiectasis is promoted; therefore, the application of bronchoscopic aspiration in cases of lung collapse is indicated as soon as possible. A number of case reports are given in detail, emphasizing various points in diagnosis and treatment by bronchoscopy. It was shown that the occlusion of the bronchus by mucus plugs may produce the same effect as a foreign body in the production of atelectasis. No doubt in many cases of bronchiectasis in children, especially those with asthma, the condition may originate as a result of plugging of the bronchi with mucus, which is followed by secondary infection.

Andrews<sup>85</sup> states that the value of bronchoscopy in bronchial asthma is threefold: diagnostic, aspiration of secretions for vaccines, and therapeutic. He further states that bronchoscopy is of diagnostic value in bronchial asthma because it is a means of determining the type of tracheobronchial changes and of differentiating asthma from other conditions. He found that vaccines prepared from bronchoscopically aspirated secretions were more satisfactory than ordinary sputum vaccines. In certain cases, definite improvement followed the aspiration of secretions. He feels, however, that bronchoscopic therapy is a symptomatic method of treatment and is only an adjunct to allergic management.

Andrews makes no reference to the cytologic study of the secretions from the tracheobronchial tree. In studies of this type, the cytologic examination of the secretions should be correlated with other findings. In certain cases, accurate diagnosis may be dependent entirely on cytologic findings.

Bronchoscopic examination in doubtful cases of asthma is frequently of indispensable value in diagnosis, especially in those instances in which the typical eosinophilia of the bronchial secretions and other symptoms and signs are lacking. Pollak, Cohen and Gnassi<sup>86</sup> present a very comprehensive review of the literature on inflammatory bronchial tumors. The increasing recognition of these lesions is a result of the greater use of the bronchoscope and the increasing knowledge of the mechanical and biological sequelae of these lesions. Since dyspnea is often an outstanding symptom in these cases, they must not be erroneously diagnosed as bronchial asthma.

In discussing the subject of tuberculous tracheobronchitis, Samson<sup>87</sup> and his coworkers call attention to the varied symptomatology of this condition. Among the various signs and symptoms, it is noteworthy that persistent inspiratory or expiratory wheezing is not infrequently present. Attacks of asthmatic breathing with prolongation of one or both respiratory phases, they state, are frequently mistaken for asthmatic bronchitis. Bronchoscopy is not considered contraindicated in active pulmonary tuberculosis. Bronchoscopically, the following types of tracheobronchial lesions are recognized, although any patient may show a combination of lesions: 1. Nonulcerative and nonstenotic, characterized by circumscribed infiltration and thickening, and often by submucosal

tuberculoma formation; 2. hyperplastic, characterized by submucosal proliferation and tuberculoma formation; and 3. ulcerative, diffuse or circumscribed loss of mucosa.

Lockwood<sup>88</sup> points out that primary carcinoma of the bronchus is not a rare disease; it comprises from 6 to 8 per cent of all carcinomata. In frequency it ranks next to malignancies of the gastrointestinal tract. Emphasis is placed upon the careful examination of the sputum of tumor tissue or cells. Many of these patients present symptoms simulating asthma. Wheezing is a common symptom of partial obstruction to a bronchus and is continuous, being influenced by cough and deep inspiration, and often is not noticed by the patient. Bronchoscopic examination for purposes of inspection and the removal of secretions and tissue for microscopic diagnosis plays an important part in the management of these cases.

#### ALLERGY AND BRONCHIECTASIS.

Bronchiectasis is not an infrequent complication of bronchial asthma; on the other hand, chronic bronchitis and bronchiectasis may occur in the absence of definite asthma. Polypoid changes in the nose and paranasal sinuses similar to those noted in allergy cases commonly coexist in cases of bronchiectasis without asthma. Few observers have paid any particular attention to the incidence of allergy in these cases. The changes in the nose and sinuses and the bronchi have been treated on an infectious basis. Those patients with pathologic changes in the sinuses have been subjected to surgical procedures because of the possible etiologic relationship of the two conditions. Now, the question arises as to the possible part played by allergy in bronchiectasis, with or without coexisting sinus changes.

Fifty consecutive cases of asthma of a duration varying from three to 10 years were studied by Viswanathan<sup>89</sup> with the idea of determining the incidence of bronchiectasis. Roentgenograms were taken in all cases with the use of iodized oil. Fourteen patients showed definite evidence of bronchiectasis, six showed saccular dilatation, five cylindric dilatation, and three early bronchiectasis, with tortuosity of bronchioles and slight cylindric dilatation. Ten of the 14 patients presented clinical evidence of chronic bronchitis with asthma, but the history was suggestive of the primary condition being asthma.

The incidence of sinusitis in 217 patients with bronchiectasis exclusive of congenital bronchiectasis, or with bronchiectasis due to a foreign body was investigated by Walsh and Meyer.<sup>90</sup> Among the 217 patients, 145, or 66.8 per cent, showed associated sinusitis. Various symptoms and illnesses, such as influenza and pneumonia, preceded the apparent onset of the bronchiectasis. The process involved both lungs in 109 cases, and the bases alone were involved in 99 of these. The 36 remaining cases had unilateral involvement. There was no predominance of disease of the right lung over that of the left. Forty-two patients showed only mild bronchiectasis; in 81, the disease was moderately advanced, and in 22 the condition was far advanced. The extent of sinus involvement was variable and there was no relation between the degree of sinusitis and the degree of bronchiectasis. Chronic pansinusitis or gross bilateral infection of the antrums was noted in 78 cases. Most of the 72 patients who presented no evidence of sinusitis attributed the onset of bronchiectasis to definite disease or symptoms. In 29 cases the cause was unknown. Nineteen dated their illness from pneumonia, and seven had influenza. Only 14 per cent failed to give a history of disease of the respiratory tract at some time in the past. Both lungs were involved in 39 cases of bronchiectasis without sinusitis. In 34 unilateral cases without sinusitis, the right lung was involved 19 times and the left lung 15 times. In 23 cases the degree of bronchiectasis was mild; it was moderately advanced in 45 and far advanced in 14.

The part played by sinusitis in 75 cases of bronchiectasis was investigated by Goodale.<sup>91</sup> On the basis of X-ray evidence, 46 patients had chronic sinus infection, and 29 had negative sinuses. Among the 29 negative cases, 18 gave a history of clinical evidence of sinusitis, either a recurrent acute sinusitis or a mild chronic sinusitis. In 11 cases, or 14.5 per cent, sinusitis did not appear to play a part in the onset or subsequent course of the bronchiectasis. The majority of the cases of bronchiectasis followed infections of the upper part of the respiratory tract. Pneumonia alone accounted for 25 cases. Goodale found that the prevalence of sinus infection paralleled the extent of the bronchiectasis. The sinuses were infected in 40.7 per cent of those patients in whom only one lobe was involved, and in 73 per cent of those in whom more than one lobe was involved. It was further stated that once the patient



has acquired a chronic sinusitis, the chances of further damage to the lungs is increased because of the susceptibility to repeated infections of the respiratory tract.

The above-mentioned reports are representative of many observations made during the past several years on the subject of sinusitis and bronchiectasis. The study of the cytology of the secretions for eosinophiles has not been utilized as a diagnostic procedure in these cases nor have they been investigated from the allergic standpoint. There is much need, therefore, for further studies on the possible incidence of allergy in bronchiectasis. The recent report by Watson and Kibler emphasizes this important relationship.

Watson and Kibler<sup>92, 93</sup> noted that bronchiectasis is seldom found without at least some evidence of sinusitis. They also observed that many cases of bronchiectasis had some manifestations of allergy, such as hay fever, asthma, urticaria, eczema or rhinitis. Upon studying the cytology of the nasal secretions, they were impressed with the frequency of the high percentage of eosinophiles. A similar study of the sputum likewise showed an abundance of eosinophiles in a large percentage of the cases of bronchiectasis. On this basis they began the investigation and treatment of these cases from the allergic standpoint and were able to obtain most satisfactory results.

Thus, a new conception of the etiology of bronchiectasis which makes its prevention and recovery possible has been presented. They found that bronchiectasis may frequently be successfully combated in its earlier stages if considered a sequela of allergic bronchitis. In view of the fact that many patients with chronic sinus involvement and bronchiectasis seek the warm dry climate of Arizona for relief, the authors have had an unusual opportunity to observe many cases of this type.

They have noted that patients with bronchiectasis frequently have hay fever, eczema, moderate but definite asthma at times, or other manifestations of clinical allergy. Among all patients with bronchiectasis it was observed that in general there was an abnormally high percentage of eosinophiles in the bronchial secretions; that is, 10 per cent or more. In fully 90 per cent of the cases, a definite diagnosis of allergy could be made on the evidence found.



Watson and Kibler divide all bronchiectasis into these classes:

1. Congenital bronchiectasis.
2. Mechanical bronchiectasis, as accompanying tuberculosis, thoracoplasty, fibrous pleuritis, pulmonary fibrosis and so on.
3. Allergic bronchiectasis.

In studying bronchial disturbances by X-ray studies with iodized oil, cytologic examination of sputum and nasal secretion and cutaneous testing, four types of cases were encountered, as follows:

1. Cases diagnosed as bronchiectasis, with chronic cough, purulent sputum, basal lung râles with no X-ray evidence of bronchial dilatation as shown with iodized oil but only basal allergic bronchitis. Symptoms in these cases often existed for 10 years or more.
2. Cases similar to the first type in which slight bronchiectasis exists, as evidenced by lack of tapering of the descending small bronchioles.
3. Cases with moderate bronchiectasis.
4. Cases with far advanced bronchiectasis, in which marked pocketing is shown and large amounts of foul, purulent sputum are raised.

In each of these four types, strong evidence of allergy was found. The authors report one case of each type in detail. On the basis of their observations on all these stages of bronchiectasis and the fact that the majority of patients had accompanying manifestations of allergy, the authors feel that most bronchiectasis is caused primarily by basal allergic bronchitis. It is considered preventable, therefore, if the basal allergic bronchitis is recognized as such and given intensive treatment before bronchiectasis develops. They further state that, even after bronchiectasis has developed, the disease may be successfully combated if treated early.

Upon allergic investigation it was found that most patients were sensitive to inhalants but in a few cases foods were the most important. Improvement was in proportion to the advancement of the disease.

The development of bronchiectasis is explained on the following basis: first, there is a basal allergic bronchitis; second, an atelectasis; and third, in a variable length of time the bronchiectatic dilatation.

#### OCULAR MANIFESTATIONS OF ALLERGY.

Comparatively few papers have appeared on the relation of allergy to ophthalmology. Jones<sup>84</sup> reports a case of dermatitis venenata in the use of physostigmine salicylate in the eye. It caused burning, itching and edema of the upper and lower lids. A positive test to physostigmine salicylate was obtained within 48 hours after application to the skin.

Upon a careful search of the literature, Parkhurst and Lukens<sup>85</sup> could find reports of only three cases of dermatitis caused by butyn. They add a fourth case of a patient, age 49 years, in which 2 per cent butyn was used in the eye as a local anesthetic. The next day the patient had a marked swelling and itching of both eyelids on the right side. The following day there was a more severe dermatitis of the lids, with vesiculation and edema; the eye was swollen shut. An erythematous vesicular streak, about 5 mm. wide, extended down the cheek to the chin, apparently following the path along which the solution had run. A positive patch test was noted 24 hours after application to the skin of the arm. The opinion was expressed that such instances of sensitivity to butyn occur more frequently than the paucity of reports would seem to indicate. A case of sensitivity to butyn of a similar nature came under our observation only recently. The skin of the eyelids in both sides were markedly involved with a dermatitis. Eye drops containing butyn had been used. A positive patch test was demonstrated.

Woods<sup>86</sup> gives an excellent summary of the present status of the relationship between allergy, iritis and conjunctivitis. He describes three types of allergic conjunctivitis; first, the acute edematous type, characterized by sudden onset, edema, conjunctival congestion and lacrimation. This type is most commonly seen with asthma and hay fever. The second type is the so-called edematous eczematous type, characterized by eczema of the lids and neighboring skin, edema of the lids, profuse lacrimation, conjunctival congestion and slight chemosis. This type is that caused by drugs such as butyn,

atropine, etc. This type is always accompanied by marked hypersensitiveness of the skin as shown by positive patch tests with the offending substances. The third type is the chronic recurrent irritative conjunctivitis often associated with low-grade folliculosis with sharp exacerbations and normal bacteriologic findings. Pollens, epidermals, foods, etc., may be the cause, and the conjunctivitis may be the only manifestation of allergy in the individual. Woods discusses at some length the relation of staphylococcus toxoid to conjunctivitis. He reviews our present understanding of the nature of vernal catarrh and enumerates the reasons for classifying it as an allergic disease.

Woods further states that certain types of recurrent uveitis and iritis are allergic reactions resulting from sensitization and intoxication of the tissues by bacterial products. He believes that there is little justification for the use of vaccine therapy in the treatment of recurrent iritis because of the difficulty in determining the causative organism.

Cutino<sup>97</sup> discussed various allergic eye diseases, such as the conjunctivitis associated with hay fever, vernal conjunctivitis and a few other diseases which may also be contributed to allergy; namely, phlyctenular conjunctivitis, parenchymatous keratitis, sympathetic ophthalmia, endophthalmitis anaphylactica, episcleritis, iritis, ulceration of the cornea and marginal blepharitis. The importance of food sensitization as well as contactants and inhalants is emphasized.

In 292 cases of external eye conditions in children (60 phlyctenular keratitis, 67 chronic conjunctivitis, 81 blepharitis, 48 trachoma and 36 interstitial keratitis) tested by the prick method for a series of allergens by Sorsby and Benham,<sup>98</sup> negative results were obtained in all but one case. This patient, who had chronic conjunctivitis, gave a mild reaction to grass pollen.

A case of chronic conjunctivitis caused by hypersensitivity to silk was reported by Taub.<sup>99</sup> Removal of contact to silk and specific desensitization resulted in a cure. The importance of recognizing hypersensitiveness in many cases of chronic conjunctivitis is emphasized in order to avoid more serious complications.

In the study of a case of conjunctivitis reported by Simon,<sup>100</sup>

the following evidence indicated that the chief etiologic factor was an allergic reaction to the spores of air-borne fungi. Seasonal variations in the patient's symptoms coincided with seasonal variations in the atmospheric concentration of fungus spores. Changes in the patient's geographical location were accompanied by changes in his symptoms. Skin tests with fungus extracts were definitely positive. The clinical symptoms of conjunctivitis were reproduced by the application of fungus extract to the conjunctiva. The control test in a non-sensitive subject was negative. The patient was exposed to fungus spores, in that these were cultured in abundance in his home. Hyposensitization with fungus extracts was followed by the relief of symptoms.

Goodman<sup>101</sup> has made a very extensive study of hypersensitivity to lens protein in a group of 700 unselected patients with cataract who were admitted to the Wills Hospital during 1932. Approximately 5 per cent of the 700 patients tested intracutaneously with bovine lens antigen were found to show reactions to 2+ or greater and were regarded as being truly hypersensitive to lens protein. He believes that hypersensitivity to lens protein is acquired and not congenital. Cataractous cortical material forms the principal antigenic factor. Hypersensitivity to lens protein occurs only in patients with diseases of the lens. No relationship was found between diabetes, syphilis or asthmatic and hay fever allergic states and the production of autosensitization to lens protein. Attention is called to the fact that when lens material is left in the eye of a nonsensitive individual it is not as great a source of danger as it is when left in the eye of a sensitive patient. It was also noted that the amount of lens material remaining in the anterior chamber after operation is, in general, in direct ratio to the degree of postoperative reaction, whether in sensitive or nonsensitive individuals. It is also stated that lens material left in the eye following operation may have a deleterious action because of its toxic mechanical or antiphylactic properties, the latter being productive of the most severe types of reactions. A combination of the above three modes of action is also to be taken into consideration. Desensitization to lens protein is advocated before operation in hypersensitive individuals. Desensitization during the active stage of endophthalmitis phacoanaphylactica is not considered advisable. Goodman advocates the attempt at intracapsular extrac-

tion in all favorable cases when there is any reaction to the cutaneous test with lens protein. In the event of a rupture of the capsule, thorough irrigation of the anterior chamber to remove all cortical material should be carried out.

Skin sensitivity to lens and its relation to ophthalmitis phacoanaphylactica has been discussed by Burky,<sup>102</sup> who advanced supportive evidence on the basis of animal experiments, employing as sensitizers a combination of lens extract and of staphylococcus toxin.

Woods<sup>103</sup> discusses the possibility that sympathetic ophthalmia may be due to a sensitivity to the melanotic pigment of the eye and seeks to support this hypothesis through the evidence of skin reactions to tests with uveal pigment.

That allergic reactions may occur in the retina has been demonstrated by Bedell.<sup>104</sup> In one of his case reports, the following description was given: the entire retina was edematous and overspread with superficial striate and somewhat deeper surrounding hemorrhages. The veins were distended but not overtortuous, and in places partially hidden by the overlying retina. The lumen of the arteries was irregular. The macula was clearly outlined, irregular, dark, oval, surrounded by deep retinal hemorrhages — a shower of petechial hemorrhages. After a period of about two and one-half months, these hemorrhages all disappeared. Another case was described in which the allergic reactions in the retina occurred following the injection of tetanus antitoxin. The nerve head was completely obscured by thick, white, edematous swellings, which appeared like irregular balloons of various sizes and prominence, with several superficial hemorrhages over them. Although the arteries were normal, the veins were at least twice their normal size.

In a paper on the clinical manifestations of allergy in the eyes, Bedell<sup>105</sup> calls attention to the various ocular conditions which are classified in this group. Particular attention is called to the allergic involvement of the conjunctiva, lids and cornea. The occurrence of retinal allergy, which had previously been reported by Bedell, was also discussed. In the discussion of this paper, Berens presented statistical data on the results obtained from intravenous injection of crude and purified cultures of various organisms from 21 patients with eye

lesions and 14 patients without eye lesions. Among 103 patients with cataract on whom skin tests were done with lens protein, he found 51 negative reactions, 13 doubtful and 39 positive. The results of tests with uveal pigment in a variety of ocular conditions showed in 82 cases, nine positive reactions, 59 negative and 14 doubtful.

Plumer<sup>106</sup> reports a case of retinal allergy. The patient was a physician, age 35 years, who complained of blurring of vision of the left eye, of sudden onset and of two weeks' duration. There was a reduction of visual acuity, blurring of vision of the left eye, and a slight congestion and haziness of the left macula. Removal of the tonsils and infected teeth resulted in the condition clearing up. A few weeks later, however, there was a recurrence of symptoms. At the onset the patient had ingested peanuts. There was a personal history of migraine, hay fever and intolerance to chicken meat. Positive skin tests were obtained to chicken meat, early grass pollens, beans, cottonseed and peanuts. Removal of these substances from the diet resulted in the clearing up of the symptoms.

Prewitt<sup>107</sup> reports a case of retinal detachment, probably of allergic origin. The patient, a man, age 62 years, gave a past history of urticaria and angioneurotic edema. Previous to complete retinal detachment, several attacks of transient blindness occurred, which were usually associated with generalized angioneurotic edema and urticaria. On one occasion following the ingestion of turkey liver, he developed a marked edema of the jaws and cheeks, accompanied by large blebs on the cornea of the left eye.

#### DISCUSSION.

Although the recent current literature reveals an increasing interest in allergy as related to otolaryngology and ophthalmology, there is still much need for greater attention to methods of diagnosis and proper treatment. The early recognition and treatment of allergy, especially that involving the nose and paranasal sinuses, offers the possibility of preventing the extensive pathologic changes which, when complicated by secondary infection, require radical types of surgical interference. Even when hyperplastic and polypoid changes have developed, allergic methods of treatment may be followed by a resolution or resorption of the edematous changes. In many instances surgical procedures are not necessary. When indicated, however, conservative measures may suffice instead of the radical. In the management of the pure suppurative disease of the paranasal sinuses the proper treatment of the acute types may prevent the establishment of chronic disease. This state of affairs is certainly evident in the case of otitis media. With proper attention to the acute process, chronic mastoid disease has been preventable to a great extent. Consequently, few cases

of chronic mastoiditis requiring radical procedures are observed today. The use of sulfanilamide and related compounds is playing a great part in decreasing the incidence of complications in acute sinus and mastoid disease. The early recognition and proper management of allergic disease likewise may prevent extensive pathologic changes and secondary infections. Adequate treatment of the allergic sinus patient today certainly offers much more promising results as compared with those which followed the methods previously at our disposal.

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RELATIONSHIP OF PARANASAL SINUS DISEASE TO  
OCULAR DISORDERS. A NEW CRITICAL METHOD  
OF INVESTIGATION BY LAMINAGRAPHS.

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DR. L. W. DEAN,\* St. Louis.

The diversity of opinion among qualified observers as to the relationship between paranasal sinus disease and ocular disorders has created an absolute necessity for a complete study and better evaluation by otolaryngologists. Conventional X-ray, cytological examinations and nasal cultures, in addition to a careful history and a meticulous clinical examination are basic necessities. The above may be sufficient to meet the needs of most patients suffering from sinus disease, but if there is to be a proper evaluation of the relationship of sinus disease as a causative factor in any condition where spontaneous recovery occurs as frequently as in retrobulbar neuritis or other ocular disorders, some critical method of demonstrating and following such patients must be used.

The clinical abilities of such men as Meyer Wiener, S. R. Gifford, the late W. H. Wilmer, and Greenfield Sluder are sufficient to keep the problem of sinusitis as related to retrobulbar neuritis open for discussion. The statistics of William L. Benedict, Walter I. Lillie and James I. Moore make it essential that a different approach and follow-up be developed. Lillie<sup>1</sup> states that "only one case due to sinusitis of retrobulbar or optic neuritis has been observed at the Mayo Clinic." James I. Moore,<sup>2</sup> in reporting on 150 cases from Johns Hopkins University and hospitals, states that "posterior sinus disease was the etiologic factor in but a few cases." Benedict<sup>3</sup> states, "the effects on the optic nerve of disease of the nasal sinuses are not established." Against these rather large statistical groups we have an imposing number of excellently studied

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patients, in which percentages of retrobulbar neuritis as related to sinus disease are much higher. Wilmer,<sup>4</sup> in 1930, in a group of eight cases attributed one to sinus infection. Gifford<sup>5</sup> reported 13 cases, four of which were thought to be disease of the nasal sinuses. Wiener<sup>6</sup> reports many cases from his records where the relationship to sinus disease is unquestioned. L. W. Dean<sup>7</sup> has classified sinus disease as one of the most important causes of retrobulbar neuritis.

It is rather amazing, after reviewing the critical reports of ophthalmologists, in which neurological conditions are stressed almost to the total exclusion of disease of the sinuses, to find a careful complete neurological report on optic nerve complications of nasal sinus disease reported by Strauss and Needles<sup>8</sup> from the Mt. Sinai Neurological Service. Their conclusions show a much broader appreciation of all phases of the problem than some of the reports by ophthalmologists. They state: "Mindful of the frequency of multiple sclerosis as a cause of retrobulbar neuritis, of the large percentage of cases of retrobulbar neuritis that spontaneously recover, as well as of cases that are reported cured after simple adrenalization of the nose; mindful of the fact that diseased sinuses are present in such a large proportion of our population that they may erroneously be incriminated as the cause of a host of conditions, and mindful also of the occasional untoward effects of nasal surgery, it is, nonetheless, our opinion that in some cases operative intervention is indicated. We do not go to the extreme, advocated by some, of insisting on histologic examination of tissue before dismissing the sinuses as normal. But if the rhinologist, specially trained, concludes as a result of his examination that the sinuses are definitely diseased, and no other cause for the neuritis is apparent, we favor eradication of the focus. Especially if continued observation shows progression in the visual impairment. It may be that a number of our cases would have improved spontaneously. It may be that some of our cases will eventually turn out to be instances of multiple sclerosis. But no one can be certain that any of these cases, if left untreated, would not have developed permanent optic atrophy. And who, so long as such a possibility exists, will be content to wait a decade or more on the chance of multiple sclerosis finally announcing itself instead of taking remedial measures at once? A healthy reaction away from indiscriminate nasal surgery should not lead



one to the other extreme of withholding surgery when it seems urgently indicated; especially since, in competent hands, untoward effects are rare. Even in those cases in which the diagnosis of multiple sclerosis is well established, if a retrobulbar or an optic neuritis is present and diseased sinuses, which may be the responsible factor, are found, we think it justified to treat the sinuses just as if multiple sclerosis did not exist."

Albert N. Lemoine<sup>9</sup> reports an excellent study of a single case of optic tract lesion, probably the result of opticochiasmal arachnoiditis due to infected sphenoid sinuses. He states that "case examination revealed no crust or pus in the nasal passages and no change in the nasal mucosa." In the operative findings the case showed only a thickening of the mucoperiosteal lining of both sphenoid sinuses, with a hemorrhage into the mucoperiosteal lining of the posterior superior wall of the right sphenoid sinus. No pus in either sinus. Albert D. Frost,<sup>10</sup> in a paper on papilledema associated with sinus disease, reviews most completely the literature, and reports two cases with papilledema which were relieved by operation on the posterior nasal sinuses. The operative findings showed marked congestion of both ethmoids, in the left sphenoid, and there was thickening of the lining of the left mucous membrane, but no polypoid tissue. Conservative treatment had failed in both of his cases. One of his patients had a definite allergic coryza. He states that "the sinus may have been the focus of a specific virus that had a predilection for the optic nerve tissues after its dissemination by the general circulation, possibly on an allergic basis." L. E. White<sup>11</sup> states that "the anterior portion of the nose frequently appears normal. The one vital point to determine in the nasal examination is the size and position of the middle and superior turbinates. Do they block the ventilation of the posterior sinuses? Is there impaired aeration? . . . The mistake is frequently made of expecting to discover marked changes." H. H. Stark<sup>12</sup> states, "from a nasal standpoint, we cannot expect to find the common symptoms of sinus infection — pus, polypus, history of nasal discharge, etc. — as we are dealing in most cases with a closed sinus." Stark states that "Roentgenography gives little aid in the diagnosis." This also was true in White's<sup>13</sup> report, in which at least 75 per cent of his cases had negative Roentgen ray findings. Sluder<sup>14</sup> states, in a discussion on eye

involvement, "I have been able to recognize in these cases hyperplastic sphenoiditis, often with acute processes added, and have relieved the eye trouble with the ethmoid-sphenoid operation. . . . In other parts of the nose the hyperplastic lesion does not have the same pernicious possibilities . . . but I can understand that the difficulties in the way of a conclusion concerning this area (in posterior sinuses) may be almost insuperable."

W. D. Gill<sup>15</sup> reported paranasal sinus infections as being present in 48.33 per cent in a series of 120 patients suffering from chronic uveitis. The type of infection which he reported as most commonly present was a low-grade inflammatory reaction, usually designated as latent or concealed infection. The editorial criticism of his paper by the Editors of the *Year Book of Ear, Nose and Throat*, for 1935, George E. Shambaugh, Elmer W. Hagens and George E. Shambaugh, Jr.,<sup>16</sup> is interesting because it typifies the usual criticism commonly made. Their statement is, "the author's (Gill) effort to localize the blame for systemic infection upon foci in the sinuses arouses one's suspicion that his diagnosis of sinus disease includes cases where there would be room for difference of opinion regarding the reliability of diagnosis of sinus disease. This conclusion is substantiated by the type of sinus disease which the author finds, namely, inflammatory reactions, so-called latent or sealed infection. Cases that fall in this classification of sinus disease would not ordinarily be recognized as sinus disease. In his closing paragraph, the author emphasizes the difficulty of eradicating this type of sinus trouble by operative interference. This observation will be accepted by many as an indication that there is no causative relation between the so-called sinus trouble and the systemic disturbance."

William Cone and J. A. MacMillan<sup>17</sup> report an extensive study on the optic nerve and papilla. They state, "we feel that the edema early involves the naked nerve fibres, specifically causing their swelling. . . . It is our impression that the first swelling is not degenerative. No changes are demonstrated in the ganglion cells. Special stains show no secondary alterations in the centripetal nerve fibres. The later stages of the process, when the neurofibrils disappear and cytooid bodies are formed, are obviously degenerative." In regard to inflam-

mation, they state "the uncertainty as to what constitutes an inflammatory reaction in the central nervous system holds for the optic nerve and papilla. The terms neuritis and papillitis are used to cover a variety of histologically different pathological conditions. If we limit the term inflammation to processes characterized by hematogenous cellular responses, many conditions now classed as inflammatory should probably be placed in a different category. If the term is used to indicate reactions of nervous tissue to all types of injury, most of the known morbid processes may be designated as inflammatory." Further, they state, "histological preparations represent a cross-section of pathological processes at one phase of the life history of the process, the phase present at the time the tissue is fixed. A process, initially inflammatory, may show only degenerative or progressive changes at the time it is studied. It may be impossible to read back from the sections the sequence of events; nevertheless, if histological studies are to be used as a basis on which to correlate clinical entities, we must follow some rules, and those of Nissl seem most logical. His principles of inflammation applied to the optic nerve and nerve-head will help to clarify neuritis and papillitis. Papillitis will not be confused with papilloedema. Pure degenerative conditions will not be classed as inflammatory."

One of us (A. J. Cone) cannot conceive that the relationship of any focus as a causative agent in a disease can be judged by the severity or extent of the focus. The mere presence of pus is especially a poor criterion when one considers the possibility of allergy or virus disease being among the important possibilities in any of the ocular diseases. This makes it especially necessary to consider a method permitting of critical evaluation, whether any given case comes to surgical interference or is controlled by medical or local treatment.

Radiography of the paranasal sinuses, either with or without lipiodol as a contrast medium, is of extreme clinical value, but because of superimposition of structures there are great limitations of this method of examination in cases of suspected disease of these structures. This is particularly true in the case of the ethmoid and sphenoid cells, the former more than the latter. It occurred to one of us (Sherwood Moore) that the application of a new principle in radiography would be of extreme value in this type of radiological investigation,

as it had amply proven itself to be in other anatomical regions. This principle is known under the general term of *body section radiography*.

Body section radiography can be defined as a method whereby a selected and predetermined layer of the body can be radiographed with the exclusion of the shadows of overlying and underlying structures. This is accomplished by having a co-ordinated, synchronized movement of X-ray tube and film about a fixed point during an X-ray exposure. The fixed point can be adjusted to the level of the body which it is desired to radiograph. For the historical development of this principle, details of the apparatus used for this purpose and for the several methods and technique, the reader is referred to the work of Vallebona,<sup>18</sup> Chaoul<sup>19</sup> and Grossman,<sup>20</sup> Ziedses des Plantes,<sup>21</sup> Andrews,<sup>22</sup> Kieffer<sup>23</sup> and Moore.<sup>24</sup> The methods of body section radiography are: *stratigraphy* (Vallebona), *tomography* (Grossman and Chaoul), *planigraphy* (Ziedses des Plantes) and *laminagraphy* (Kieffer and Moore). It is urged that those referring to this method of radiography use the general term *body section radiography*, and the specific terms *stratigraphy*, *tomography*, *planigraphy* and *laminagraphy* for the particular types of apparatus or method employed. For the work which we present, the laminagraph has been used.

One of us (Sherwood Moore) in a previous paper forecast that "laminagrams should aid materially in such conditions as petrositis of the temporal bone, conditions involving the temporomandibular joint, and deep-seated paranasal sinuses, to mention only a few anatomical regions."<sup>24</sup> This belief arose from the fact that this general statement holds true, "body section radiography has its chief value where there is a maximum number of superimposed structures, and, conversely, it is of less value where the opposite is the case."<sup>25</sup> The experience in the series of five cases herewith presented more than confirms this anticipation, not only in examination of sphenoid and ethmoid but also the maxillary sinuses. This method of investigation of the paranasal sinuses was of conclusive value in this series of five recent consecutive cases.

Case 1: I. B., age 58 years, white male, entered Barnes Hospital on Dec. 5, 1938, complaining of blurred vision of six months' duration. Examination before admission by Dr. W. M. James had shown a bilateral caeco central scotoma for red, green and blue. Scotomata extended from

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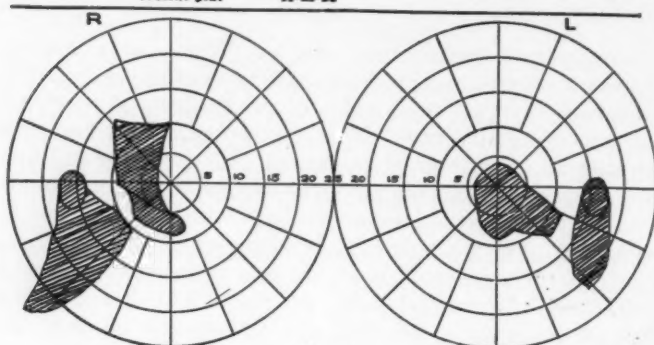
Vision O.D. 20/200  
Scotoma for white 1/230

O.S. 20/200

O'NEILL & KENNEDY  
37 West 51st Street New York

Patient J.B.

11-23-28

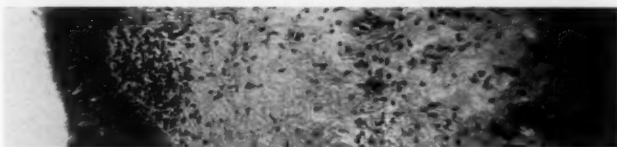


Case 1.

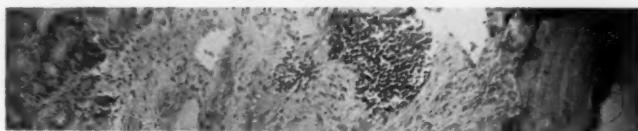


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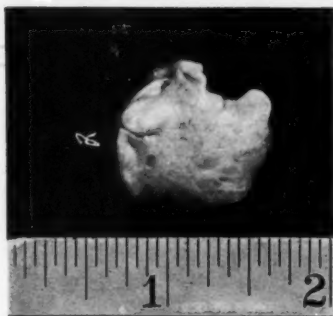
each blind spot to the point of fixation. Vision in each eye was reduced to O.D., 20/200; O.S., 20/100. There was no improvement in vision with glasses or with pinhole discs. A complete neurological study, with spinal puncture and stereos of the skull, showed nothing abnormal beside the eye defect. Colloidal gold, Wassermann and cell counts were all in normal limits. Manometric test showed no abnormality. N.P.N. blood sugar and other laboratory work were all negative. Typhoid intra-



Case 1.

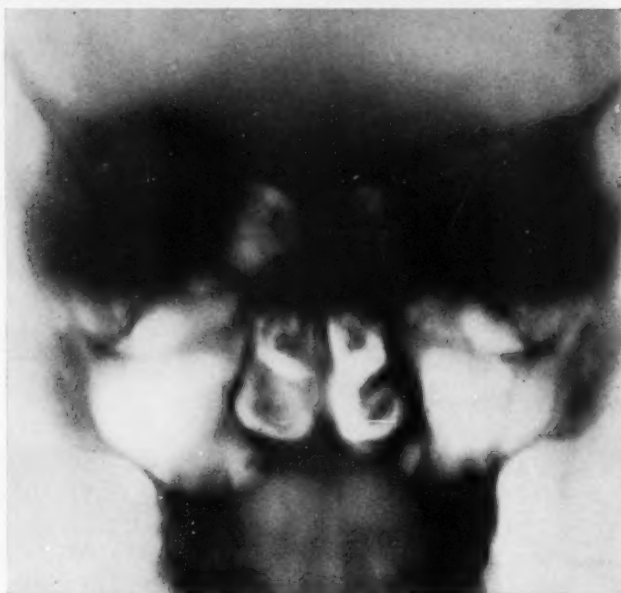


Case 1.

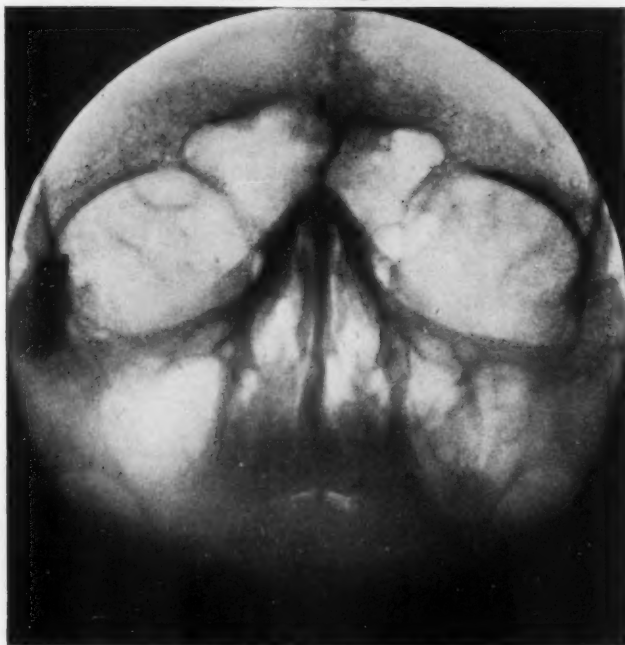


Case 1.

venously was started the day following admission. Acetyl choline was given daily subcutaneously. Dr. A. B. Jones reported a definite increase in cerebral spinal protein, which he stated as indicating destruction of nerve tissue. Intravenous typhoid and acetyl choline injections were continued. Nose and throat examination four days following admission revealed small imbedded tonsils, with a definite zone of pillar injection. There was no pus present in the nose on anterior or posterior examination. Two days later the patient had a slight upper respiratory infection



Case 2. Laminagram.



Case 2. Waters' position.



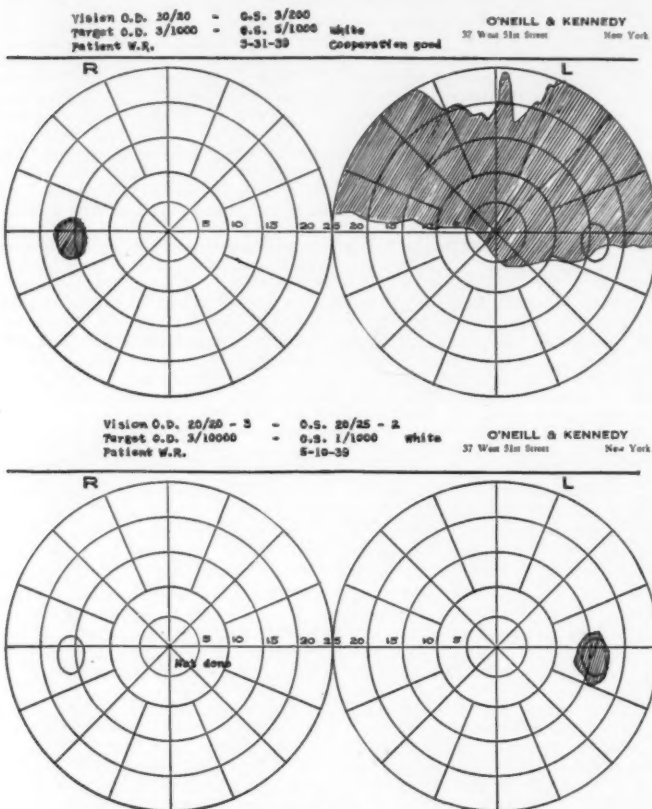
and complained of mild postnasal drip. Nasopharyngoscopic examination showed a little redness of the nasopharynx. There was no pus in the sphenoid fissures or in the middle meatuses. Nasal smears: only a rare pus cell found. Transillumination: the frontal and maxillaries were clear and equal. The intravenous dose of typhoid vaccine was increased to 100,000,000. X-rays of the sinuses, Water's position, showed a slight marginal haze of the antrums. Bilateral antral puncture and irrigation with normal saline revealed no block of ostia and no pus was obtained. Cultures of the return fluid were staphylococcus albus and diphtheroid bacilli. On Dec. 14, the intravenous dose of typhoid was increased to 200,000,000. Daily doses of acetyl choline were continued. On Dec. 15, the patient was discharged, showing no improvement in vision. The visual fields of the right eye showed some contraction in the lower temporal quadrants. The patient was readmitted to Barnes Hospital on Jan. 18, 1939. There had been no improvement in his vision since discharge. A badly infected pair of tonsils were removed, which on culture showed streptococcus viridans and influenza bacilli. The patient had an uneventful postoperative course. He was started on daily doses of betalin compound by intramuscular injection. The patient was discharged and followed at weekly intervals by one of us (A. J. Cone). Treatment consisted of local shrinkage of the nose and displacement therapy, after the Proetz technique. Because of gradual progression in the loss of vision, O.D., 20/400; O.S., 20/133, the patient was referred back to Dr. Sherwood Moore, in the Edward Mallinckrodt Institute of Radiology, Washington University, for laminagraphs of the ethmoid and sphenoid sinuses. Dr. Moore reported bilateral involvement of the ethmoid and sphenoid sinuses. The patient was readmitted to Barnes Hospital and on March 16, 1939, an intranasal ethmoid-sphenoid operation was performed. Grossly, the cells showed thickening and one posterior ethmoid cell had a thickened membrane, filled with fluid, which was removed intact. The bony walls throughout were softer than normal. The patient was discharged four days later. Eye examination 24 days after the operative procedure showed a dramatic improvement in vision. O.D., 20/25; O.S., 20/200. Weekly treatments, shrinkage and displacement irrigations were continued to the left ethmoid and sphenoid until May 2, 1939, at which time the patient was readmitted to the hospital for ethmoid-sphenoid operation, left. Identical pathology was encountered. The patient was discharged on May 5, 1939, stating that his vision was the clearest that it had been since August, 1938. Photomicrographs of ethmoid pathology follow. Cultures of the material revealed only staphylococcus.

Operative work on this patient was completed 10 months following the onset of the eye difficulty. The eye involvement was bilateral. The only positive finding for operation was obtained from the laminagraph. Every conservative measure was exhausted. In view of the history and course, this patient's eye condition must have been due to sinus disease.

Case 2: W. W. R., age 22 years, white female, entered Barnes Hospital on April 7, 1939, because of falling vision in the left eye. Present illness: About three weeks before, patient had a very severe headache, which was followed by a blurring of the left eye, which has continued to the present time. The headache was left frontal in location. There had been no acute upper respiratory infection preceding the present illness. Patient had had occasional postnasal mucoid discharge but no anterior nasal discharge. No nasal obstruction or sneezing. Patient stated that she had hives and angioneurotic edema in January, 1939, after eating shrimp. Past history and family history irrelevant. Physical examination: vision, 20/60, with an eccentric scotoma of the left eye. Pupils central, round, react to light—no nystagmus. The tonsils out. No tags. Teeth showed no changes. No infiltration of lateral bands. The lingual tonsil appeared normal. The nasopharynx showed slight edema of both lower turbinates. The sphenoid areas on each side were clean. No adenoid tissue was present. Cervical glands were not enlarged. Remaining examination

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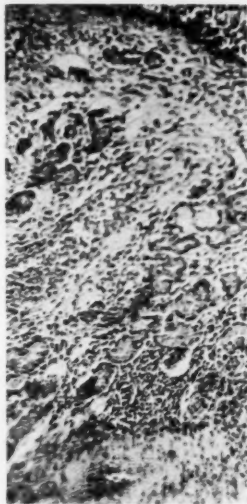
negative. This patient was examined repeatedly. Conventional films of the sinuses and lipiodol films after displacement showed no change; however, there was a delayed emptying of the lipiodol from the left ethmoid and sphenoid which was suggestive of sinusitis. The laminagraphs showed a blurring of the left ethmoid and sphenoid sinuses. Clinically, this patient had a clean nose; only slight redness of the mucosa was present. Urine analysis and blood counts normal. Wassermann negative. Dr. Lawrence Post, Dr. L. W. Dean, Dr. Sherwood Moore and Dr. R. E.



Case 2.

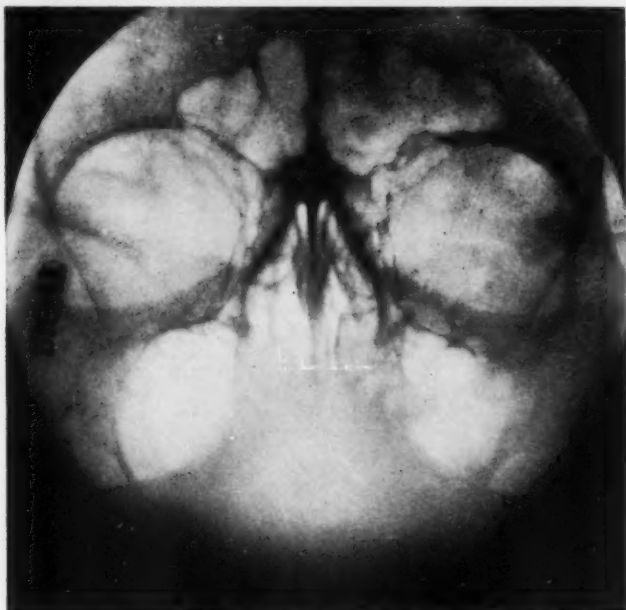
Votaw concurred in advising exploratory operation of the left sphenoid and ethmoid cells because of the serious eye prognosis. Multiple sclerosis was considered as a possibility but could not be diagnosed. The patient was operated on April 8, 1939, by Dr. R. E. Votaw. The patient was discharged three days later with marked improvement in vision. The following laminagraph demonstrates the remarkable aid obtained in this patient. Conventional film, in the Waters position, is included for comparison. The photomicrograph of the material removed from the ethmoid

and sphenoid shows marked inflammatory change. Vision and fields tested on March 31, 1939, and May 10, 1939, are shown.



Case 2.

Case 3: C. G., age 54 years, white male, a bank clerk, was referred by his ophthalmologist, Dr. Harvey Howard, to one of us (A. J. Cone), with a history of an impairment of vision which he dated to Jan. 4, 1939, at which time his tonsils were removed because of pain in his knees and heels. Just prior to the removal of his tonsils, he stated that he had had "a spreading infection" about a left lateral incisor tooth, which required treatment by his local dentist and local doctor. The loss of vision involved both eyes but was more marked on the right side. He stated that this was of sufficient degree to prevent his walking down steps or in seeing small print. He had dull headaches. In past history he denied nasal infections, epistaxis, hay fever, sneezing, asthma. He had influenza in 1917, at which time he was in bed two or three days; no complications. He had had considerable difficulty with his teeth. Twenty years ago an infected lower molar was pulled, following which he had intervals of pain and swelling over a period of 14 years. Fourteen years after the extraction (six years ago), a spicule of bone about the size of the end of a toothpick came through the gum. The tooth trouble subsided immediately. Two upper left molar teeth had been removed because of pain, infection and decay. Following their extraction 10 years ago, he had had short intervals of irritation about the left side of his face. No spicule of bone ever was found. Twenty-four years ago the patient had whooping cough, following which he had pulmonary hemorrhages every night for five weeks. Repeated medical examinations of the chest have always been clear. The family history was negative. Report of Dr. Harvey Howard on visual acuity. His vision when first examined in May 1, 1939, was: O.D., 20/40 minus; O.S., 20/20 minus. Examination of fundi: Right, moderate receding or developing optic neuritis, with a number of tiny

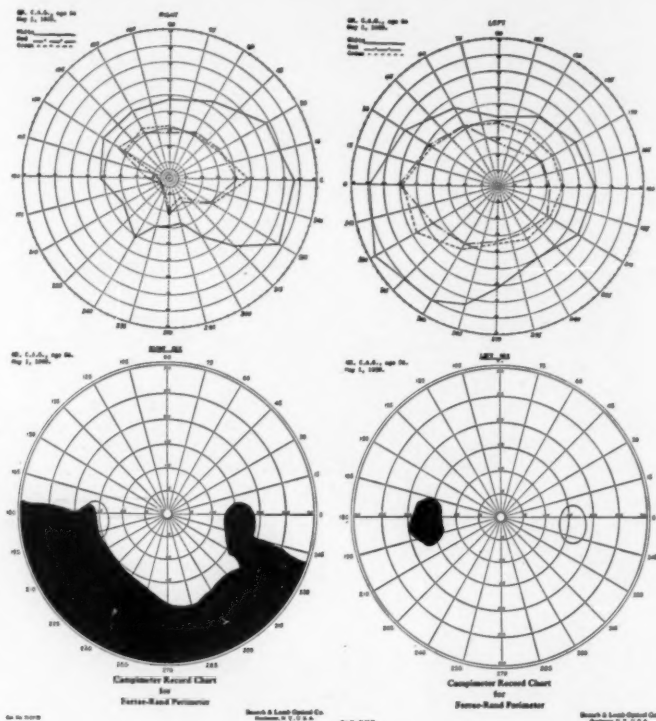


Case 3. X-ray, Waters' position.



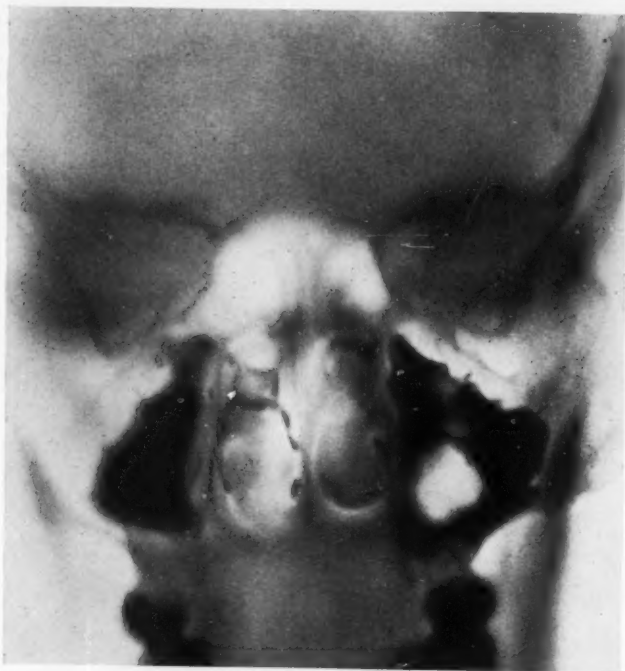
Case 3. Waters position, lipiodol.

scars in the macular area. Left, similar pathological changes but of lesser degree. The peripheral fields: Right, very marked contraction for white and for colors, especially in lower field, with field for green as large as that for red. Left, slight contraction of field, with field for red smaller than for green. The tangent curtain findings: Right, large scotoma below, connected with normal blind spot. Left, blind spot slightly enlarged. On examination the nasal membrane showed a low-grade edema. There was no pus present on anterior, posterior or nasal

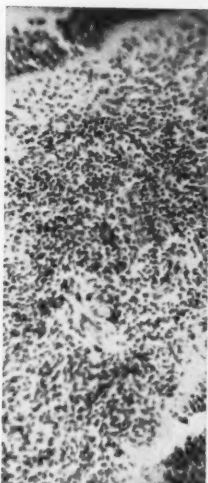


pharyngoscopic examination. Cytological study revealed a small number of pus cells. On transillumination there was a slight blur of the right antrum. The tonsils were out; fossae clean. No pharyngitis or cervical adenitis. General examination was negative; blood pressure, 132/84.

The patient was sent to Barnes Hospital. X-rays of the sinuses in Waters' position showed a slight marginal haze of the maxillaries. Diagnostic antral punctures were returned clear. The fluid was cultured. There was a small, rounded area along the floor of the left maxillary, which, in view of the dental history, was suggestive of a dental cyst. Lipiodol was injected into each maxillary sinus and the X-rays in the Waters position were repeated. This X-ray plate showed surprisingly



Case 3. Laminagram.



Case 3.

good filling. Immediately following the lipiodol injection, with plate in Waters position, laminagraphs of the sinuses were made, which showed a marked thickening of the sphenomaxillary surface of the right antrum and a free, circular filling defect in the center of the left antrum. The ethmoids and sphenoids showed a definite thickening on both sides, but most marked on the right. On May 8, 1939, a left Caldwell-Luc operation with removal of ethmoid cells and opening of the sphenoid was done. The mass in the antrum was found attached by a pedicle extending from the oblique surface of the superior maxilla at its union with the ethmoid labyrinth. The lining membrane of the sinus showed a moderate thickening. X-rays and photomicrographs on this case follow. The paper clip in the photograph of the gross specimen was used to denote the division between the polypoid mass and the remaining mucous membrane, which was removed in one piece.

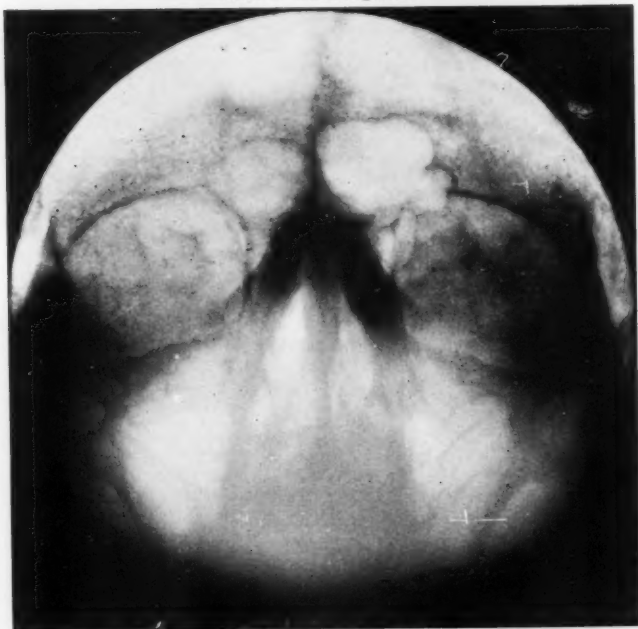
Operation on the opposite revealed the same sinus changes without a discrete polyp. Vision is steadily improving.

Case 4: W. C., age 45 years, white male. admitted to Barnes Hospital, April 21, 1939, complaining of lacrimation and redness of the left eye. Present illness dated to three weeks ago, at which time the patient noticed redness of the left eye. There was not much pain at first. He consulted ophthalmologists in Memphis, who treated him with local heat and atropine drops. Pain increased and the patient came to Barnes Hospital in extreme discomfort. Past History: He stated that he had frequent colds and that he had had an attack of "rheumatism" during the past winter, which followed a head cold. Both hips were involved, the left first, followed by the right. He has had very little postnasal discharge, rare headache, very little sneezing and no nasal obstruction, except with colds. He stated he had had a "touch of sore throat" several times during the past winter. Several teeth had been removed one and one-half years ago because of frequent colds. The eye examination by Dr. Howard showed a steamy cornea with pericorneal injection of vessels. There was softening and tenderness of the globe; marked tearing and photophobia of both eyes. The media of the left eye was hazy. The pupil was fixed. The vision on April 21, 1939: O.D., 20/20 minus; O.S., 20/133. On April 24, 25,000,000 typhoid vaccine was given intravenously and the eye showed some improvement. The pupil was a little wider and the eyeball less injected. Nose and throat examination showed an irregular septum with a high obstruction to the right. There was mucopus in both middle meatuses. On nasopharyngoscopic examination there was much more redness and edema on the right side than on the left (involved side). Nasal smears showed a moderate number of pus cells; no eosinophiles. X-rays of the sinuses showed marked marginal blurring of both antrums. Diagnostic antral punctures; irrigation with normal saline was returned clear from both sides. The throat: Tonsils small and imbedded with a definite red zone of pillar infection. There was a small superficial discrete area of infiltration in the left anterior pillar. The antral irrigations were repeated; the intravenous dose of typhoid vaccine was increased to 50,000,000. On April 28, 1939, the left eye showed material improvement. Typhoid vaccine was increased to 100,000,000. The attending ophthalmologist, Dr. Harvey Howard, suggested surgical attack on sinuses and tonsils as soon as the typhoid vaccine febrile reaction was over. On April 30, 1939, the ophthalmologist reported continued improvement but stated that there were still many cells in the media, and requested that surgery be done. On May 1, 1939, bilateral antral windows were made. Laminagraphs were taken which showed extensive ethmoid and sphenoid changes. On May 4, his vision had improved. O.D., 20/20 plus; O.S., 20/40. On May 6, badly diseased tonsils were removed. The patient is showing rapid improvement and no surgical attack on the ethmoid-sphenoid is considered at this time. His vision on May 11 was: O.D., 20/15; O.S., 20/33.



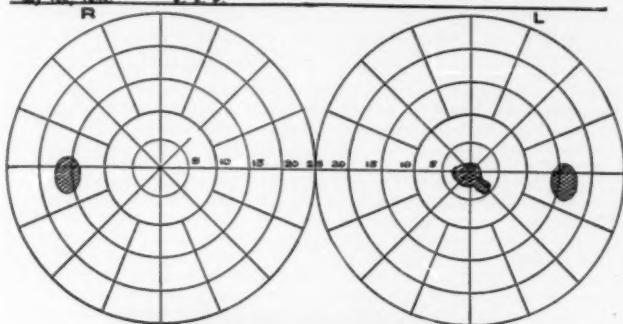


Case 4. Laminagram.

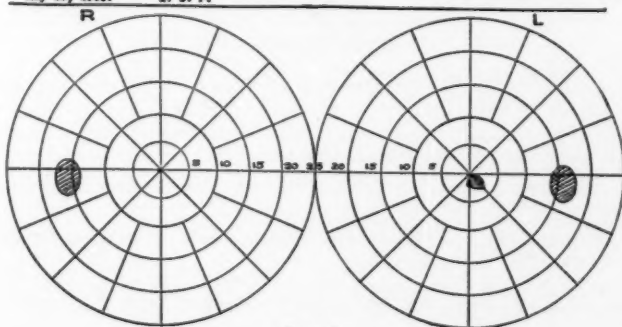


Case 4. Waters' position.

V. O. D. 20/20 V. O. S. 20/20  
CENTRAL SCOTOMA FOR RED AND GREEN 3/330  
RELATIVE SCOTOMA FOR WHITE 3/330  
May 7th, 1929. A. S. P. O'NEILL & KENNEDY  
37 West 51st Street New York



V. O. D. 20/20 V. O. S. 20/20  
PARACENTRAL SCOTOMA FOR RED AND GREEN 3/330  
May 10, 1929. A. S. P. O'NEILL & KENNEDY  
37 West 51st Street New York



Case 5.

Case 5: A. S. P., age 33 years, white female, reported May 6, 1939, complaining of blurred vision in the left eye. Dr. W. M. James reported the visual fields as showing scotomata for red and green. Vision was reduced in the left eye to 20/60. On nasal examination a slight edema and congestion was noted about the left middle turbinate. There was no pus on anterior or posterior rhinoscopy or on nasopharyngoscopic examination. Transillumination of the maxillary and frontal sinuses was clear and equal. Cytological study showed many eosinophiles. Only a rare pus cell could be found. The tonsils were absent; fossae clean. The lingual tonsil and larynx were not unusual. Laminagraphs taken within 30 minutes of first examination show marked blurring of the left ethmoid cells, 6 cm. from the tip of the nose. Because of a long-standing history of migraine, allergic nasal involvement and hives, and because no evidence of infection could be demonstrated in the cytological examination, this patient was put on a strict, immediate allergic regime. Local treatment of the nose has consisted of daily shrinkage, with cocaine adrenalin packs; displacement irrigations after the Proetz technique, with ephedrine and neosynephrin solutions. The use of ephedrine had to be discontinued because of definite blockage of the nose following its use. Known allergens have been rigidly excluded from the diet. The patient's pillow was covered with an allergen casing. Following the day of onset, she was given two doses of castor oil, and she has been given three 1 cc. doses daily of vitamin B complex, with nicotinic acid, intramuscularly. Daily visual fields and checks on visual acuity have shown a decrease in scotomata. The patient states that "the targets have lost their tails." The visual acuity has come up to 20/20. A careful neurological check by Dr. A. B. Jones is negative. There is nothing suggestive of multiple sclerosis. After this patient improved, she admitted that during the month preceding the attack of retrobulbar neuritis she had discarded entirely the allergic regime which she had followed for the past four years. During the entire month she had used a down-filled comforter, eaten beef, chocolate and nuts, all of which had been proven causes of trouble in relation to her migraine, hives and allergic nasal block. The laminagraph is presented.

#### CONCLUSIONS.

1. Sinus disease was an important finding in five recent consecutive cases of ocular involvement.
2. Laminagraphs permit an evaluation of sinus conditions not possible by other methods and should be used if there is to be a sincere effort in establishing relationship of sinus disease to retrobulbar neuritis.

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## SYMPOSIUM ON HEAD TRAUMA: DIAGNOSIS AND TREATMENT.

### (a)—THE TREATMENT OF FRACTURES OF THE FACE AND NOSE.\*

DR. J. D. WHITHAM, New York.

It is not possible in the time allowed to discuss the total subject assigned to me, so I will briefly cover points which from my personal experience seem more interesting and important. The treatment of gunshot fractures will be omitted.

The popularity of automobiles and aeroplanes has made fracture of the bones of the face much more frequent than ever before. These fractures are caused by heavy crushing blows and are often complicated by injuries which, though more dangerous to life, are not disfiguring. In such cases X-rays of the head and jaws should be taken in all positions. Unless the patient is in a dying condition, an immediate attempt should be made to correct the bony deformity in most cases, for upon recovery the patient's chief and perhaps only complaint will be the facial disfigurement.

The frontal bone is frequently broken. Complications are usually present, such as associated injuries to the base of the skull, the longitudinal sinus, the brain, the meninges, and the frontal sinus. Infection, meningitis and osteomyelitis are frequent sequels. Wounds should be carefully explored for depressed fractures, such depressions relieved and the cases treated on general surgical principles. A depressed fracture of the outer plate of the frontal sinus should be elevated and treated as an open wound.

Old depressions are usually best treated by building up with a fat or cartilage graft. About the supraorbital ridge I prefer cartilage. No artificial substances should ever be used. For a large defect of the frontal bone, McIndoe, of London, recommended a graft from the iliac bone.

\*Read at the meeting of the New York Academy of Medicine, Section on Otolaryngology, Jan. 18, 1939.

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The depression resulting from a radical frontal sinus operation is easily filled with fat or cartilage when the sinus has been completely obliterated. When not obliterated, I think no plastic operations should be undertaken.

Fractures of the upper jaw, with the exception of those involving the alveolar process only, are nearly always associated with fractures of other bones of the face, and conversely, fractures of the bones of the face are nearly always associated with fractures of the upper jaw. Fractures of the bones of the face are not limited by the suture lines between the respective bones. In nearly all cases the facial bones are impacted or telescoped. These fractures may result in injury to the lacrimal apparatus, nasal sinus infection, sequestration of bony fragments, disfiguration of the face, osteomyelitis, intracranial infection and sepsis. In this paper the malar bone will be referred to as the zygoma.

A fracture of the lower or lateral orbital ridge is the result of a very heavy blow and is often complicated by an intracranial injury. The zygoma is driven back in most cases. The lines of fracture have been described as first, through the zygomaticomaxillary suture line; secondly, through the zygomaticofrontal line, and third, between the zygomatic process and the zygoma. A comminuted fracture of the superior maxilla is usually associated. There may be a downward displacement of the floor of the orbit, which, if not corrected, produces a very unsightly deformity and a permanent diplopia. This condition is reduced by introducing a heavy sound or other blunt instrument into the antrum, and forcing the displaced fragment into proper position. The fragment may be held in place by tightly packing the antrum for two weeks with iodoform gauze or with a mass of dental compound. The comminuted antral wall fragments should be preserved if they are still attached to the periosteum and the soft parts. When detached or lying free in the antrum, they must be removed. I have made a counter-opening into the nose in these cases to facilitate the removal of the packing and to care for the secondary infection, which is certain to occur. When the antral packing does not hold the fractured bones in position, the orbital margin must be exposed, holes driven through the fragments and the bones held in correct apposition by silver wire.

A bilateral transverse fracture of the upper jaw is fairly common. In such cases there is sometimes a rotation backward of the jaw and nasal bones, resulting in great disfigurement. The profile resembles that seen in congenital syphilis. Immediate replacement is important. In these cases the nasal bones and the ethmoid bone are driven back into the nose and sometimes even into the anterior fossa of the skull. In very severe cases, reduction would be dangerous and should not be attempted. Fixation is maintained by the use of the Kingsley or other encasing splint of the upper teeth and continuous traction by a suspension apparatus. Transverse fractures of the upper jaw involving the alveolar process often throw the teeth out of alignment. Such cases are best treated by the oral surgeon, who uses a reversed Kingsley splint fastened to a head cap, or in less severe cases, wiring the teeth together will suffice.

Fractures involving the zygoma and zygomatic process are impacted. They can occasionally be reduced by inserting a sharp double tenaculum into the tissues. The tentaculum will usually break, the deformity remaining uncorrected. The antrum may be entered and the bone replaced by a heavy blunt instrument. This method may also result in failure. I believe the best method is the one advised by Gillies. This consists of making a small incision through the skin and fascia in the temporal region, the insertion of a long thin elevator under the zygomatic process and zygoma from above and prying the depressed bone into place. A roller bandage is placed under the handle of the elevator to give leverage. A firm pad is strapped to the face to hold the fragments in position.

Nasal fractures may be separated into two classes: fractures of the nasal bones proper, and fractures involving the nasal processes of the superior maxilla. The former is the result of a blow, the force of which is directed full and straight against the front of the nose. This results in a compound comminuted fracture of the nasal bones. Frequently no deformity results, but when the force has been great, the nasal bones are driven back into the upper nasal cavity between the nasal processes of the superior maxilla, which are consequently spread apart, and saddle-back deformity results. The ethmoid bone and the nasal septum are also broken and impacted. Early reduction is simple.

Late cases may require a rib cartilage or other graft, for



it is not then reducible. When operating to remove rib cartilage, the rectus abdominalis muscle should be split in the direction of its fibres, for cutting it across will result in a more prolonged and more painful convalescence. I have found much less tendency to curling of the cartilage when I remove it without the perichondrium. I do not advocate the use of ivory or any other foreign bodies.

The more frequent nasal fractures are the result of force applied to the side of the nose, such as by a right hand swing in boxing. The lines of the fracture are first, at the suture between the nasal bones and the nasal process of the frontal bone; second, through both nasal processes of the superior maxilla, about  $\frac{1}{2}$  inch lateral to the nasal bones, and third, through the perpendicular plate of the ethmoid bone. In most cases a discoloration of the nasal septum is associated. This type of fracture should be corrected at once, preferably under general anesthesia. A Kelly clamp used intranasally will usually do the work. I always over-correct and then swing the bones back to center. An external splint is helpful in retaining the bones in proper position. When there is a tendency to backward displacement of the nasal bones, a fine wire mattress suture is carried through the outside of the nose beneath the nasal bones and the ends twisted over a lead plate. I am opposed to the use of intranasal splints or packing in these cases.

Old uncorrected cases of lateral nasal deviation usually require a submucous resection. It is often necessary also to remove a wedge of bone from the nasal process of the superior maxilla on the broad side of the nose. If this is not done the deformity nearly always returns.

Nasal humps and the deviation of the cartilaginous nasal bridge may follow injuries. The operative treatment of this condition has been standardized by Joseph and others, and the results are definitely good.

Flattening of the tip of the nose may be a late result of injury. This can usually be greatly helped by shortening the nose. The method usually employed for shortening the nose is often inadequate. I believe that after several years of experimentation we have improved the technique by excisions made in the nasal vestibules of skin and cartilage combined with intranasal sutures. Fractures of the face bones are often

associated with injury to the soft parts. Their treatment will be briefly considered.

Lacerated wounds of the face and forehead should be repaired as early as possible. To prevent a wide scar, which is sometimes a late result after suture, I use a subcuticular stitch of fine white deknatol. This stitch is supplemented by many fine closely placed interrupted skin sutures of black deknatol or other braided silk suture material. Fine ophthalmic needles are used. A reading glass greatly facilitates the passing of the stitches. Usually the buried stitch is not removed, for being white, it does not show through the skin. On the forehead and near the nasolabial fold it is sometimes possible to shift the line of a wound to correspond with a natural line of skin cleavage. This makes the scar less conspicuous.

An old depressed scar is treated by excision and a buried living graft obtained from the patient. For this purpose I prefer a fat or dermal graft. Fascia and rib cartilage are useful in severe cases. Rib cartilage is advisable where a defect is present about the orbital margin, and for some cases of deformity which result from a radical frontal sinus operation. A dermal graft is especially useful in filling depressions in the soft tissues, for slight depressions of the nasal bridge, and for the frontal sinus postoperative depression. This graft may be obtained from any hairless region. The outer layer of the skin is first removed with a sharp Thiersch knife and then a piece of skin, so prepared, is removed. This is not as likely to become absorbed as a fat graft. If a very thick graft is needed, the outer skin of the thigh is used and a single piece cut to include skin, subcutaneous fat and fascia lata.

When a healed wound has resulted in scar contraction because of a loss or destruction of skin, the scar should be carefully excised, old contractures released, the tissues sutured in natural relation and the resulting skin defect replaced by a free full thickness or split skin graft.

A split graft is cut with a razor and includes only a part of the corium; it is slightly thicker than a Thiersch graft. The disadvantages are the result of tendencies to secondary contraction and to change of color. However, the split graft will give a larger percentage of successful takes than a full thickness graft. Both of these grafts should fit tightly when

sutured in place. Interrupted stitches are used. These should be left long and tied firmly over a neatly fitting piece of dental compound or roll of gauze. A firm gauze and roller bandage dressing should be then applied. The dressing should not be changed for from 10 to 14 days. V. P. Blair's method of dressing a free skin graft of this kind is to apply to the surface of the graft two layers of gauze saturated in 3 per cent xeroform, next a simple gauze pad, then a moistened sea sponge or moist cotton, and lastly, a firm roll of bandage carefully secured by adhesive tape.

Full thickness grafts should be free of subcutaneous fat. When large, they should be punctured in several places to prevent retention of secretions. Autogenous grafts should be used in all cases. Full thickness grafts should be applied to correspond to the lines of skin cleavage.

The formula for xeroform as advised by Blair is: xeroform gm. 96, paraffine gm. 1, beeswax gm. 1. His method of preparing the sea sponges is to wash them frequently in soft water containing 1-2,000th's cyanide of mercury; squeeze them and store them in sterile containers.

When there is a great loss of the tissue of the face or of the nose, pedicled flaps must be used. These are classified as simple, doubled or tubed pedicled flaps. Any of these may be delayed pedicle flaps. The delayed flap is one which is cut, raised from its position, resutured in its original position and later again cut, raised and sutured in its new position. This delayed or two-stage operation insures the nutrition of the flap and permits the use of a much thinner flap and one with a smaller pedicle.

For nose repairs, Gillies advises a tubed flap of skin extending transversely across the chest below the clavicle. This flap is very useful in replacing a loss of the lower part of the nose. For this purpose I have been using a tubed pedicle flap of the upper forehead and temporal regions. This flap replaces the nose with skin of the correct color and texture. When this is used, no postoperative scars are visible on the forehead or temporal regions, for they are concealed by the hair of the scalp.

When large areas of the face or neck are to be replaced, the experience at Bellevue Hospital has led to a preference

for unilateral or bilateral pedicled flaps taken from the sides of the chest, extending from below the axilla to the iliac crest. These flaps are believed to be more viable than flaps taken from a medial position.

Keloids and large hypertrophic scars should be excised, sutured by a subcuticular stitch and treated at once by radium or X-ray. No superficial stitches should be used, for each needle puncturing may cause a secondary keloid. The results obtained at Bellevue Hospital have been very satisfactory since this method of treatment has been adopted. All other treatments have been tried and found wanting.

The after treatment of nasal fracture cases is very important. An external splint should be used in most cases for two weeks. This can be made of copper or lead, or of dental compound reinforced with plaster of paris. A very effective external splint can be made by passing mattress sutures of silkworm gut through the fracture lines from the outside of the nose. These sutures are then tied over cotton dental rolls, which are placed one on each side of the nose. It is best to harden the rolls by soaking them in Whitehead's varnish.

I think the crest of the ilium should be used as a graft more often than it has been. It is easily and safely obtained and is the correct shape for the skull, the orbital margins, the lower jaw and the zygomatic (malar) region.

71 Park Avenue.

## SYMPOSIUM ON HEAD TRAUMA: DIAGNOSIS AND TREATMENT.

### (b)—FRACTURES OF THE SKULL INVOLVING THE TEMPORAL BONE.\*

DR. J. WINSTON FOWLKES, New York.

As the title indicates, this paper is not intended to cover the whole subject of fractures of the skull, and it will be confined to a restricted zone.

Fractures of the base of the skull more frequently involve the ear than fractures of the vault. Fractures of this type are almost always produced by falling on the head, or by severe blows directly to the head.

Fractures involving the ear and mastoid usually take one of three courses: 1. Longitudinal; 2. Transverse; 3. Rupture of the petrous apex. The third type is usually rapidly fatal and will not be considered further.

1. *Longitudinal.* These fractures involve the tegmen tympani and run forward through the roof of the Eustachian tube. They may be linear or branched, and usually do not involve the labyrinth; therefore, the usual signs and symptoms of internal ear involvement are not found. They may extend posteriorly into the mastoid and rupture the lateral sinus. This will manifest itself by free bleeding into the middle ear and into the nasopharynx by way of the Eustachian tube.

2. *Transverse.* This type starts in the region of the jugular bulb or base of the mastoid, crosses the petrous pyramid and ends on the anterior surface of the petrous bone. In this type the labyrinth and middle ear are more frequently involved, producing mastoiditis and meningitis, since the meninges are more often torn.

*Signs and Symptoms:* Generally speaking, we have the

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signs and symptoms which are encountered in fractures of any part of the skull, depending upon the extent of the fracture. They are nausea, vomiting, headache, loss of consciousness, bloody discharge from the ear canal, this discharge sometimes being accompanied by cerebrospinal fluid or pus. There may or may not be a facial paralysis. There may be no discharge from the canal, but a fracture may exist.

If a fracture is present it will be shown by a drum which has lost its lustre and taken on a bluish tint. This is also indicative of blood in the middle ear.

When the labyrinth is involved the patient complains of vertigo, tinnitus and deafness, and nystagmus will be found to be present.

Pus may be found in the discharge from the canal, and if so it is important to ascertain, if possible, whether or not a chronic otitis media existed before the accident. If a pre-existing infection is found to be the case we are more fearful of the development of mastoiditis, lateral sinus thrombosis or meningitis, and this immediately puts a different aspect upon the type of treatment.

These fractures occur, of course, in combination with fractures of other parts of the skull, and present signs and symptoms, depending upon the part injured.

The pulse rate is an important sign, as Besley reports from 1,000 cases,<sup>1</sup> "Those that had a pulse under 100 usually recovered, and those whose pulse was persistently over 100 died."

Dr. Eagleton also says, "An increasing intracranial pressure sufficient to cause a persistently rising blood pressure, if not recognized and relieved by operation, uniformly results in sudden death from respiratory paralysis."

The X-ray is an important aid in making the diagnosis and should be taken as soon as the condition of the patient permits, but is not to be relied upon in every case. In a very large series of cases in Bellevue Hospital, in which the diagnosis was "fracture of the skull" and treated as such, no fracture was demonstrable in 25 per cent of the films. I will show you two films to demonstrate the fact that the X-ray does not tell the whole story.

*Treatment:* These patients should be put to bed and kept

there longer than it appears to be necessary, the minimum time being from four to six weeks. In the beginning they should receive treatment for shock. The blood pressure should be taken at frequent intervals in order that we may detect any rapid rise or fall and that treatment may be instituted accordingly.

If blood or spinal fluid is found coming from the ear canal, it should not be tampered with under any circumstances, as there is nothing to gain and we may introduce bacteria and produce meningitis. The skin in this area should be aseptitized and a large mastoid dressing applied. If the drum is blue, indicating blood in the middle ear, it should not be incised, as the blood will be absorbed or it will drain into the nasopharynx through the Eustachian tube. If the discharge becomes pussy and mastoiditis develops, any form of operation should be postponed as long as possible, depending, of course, upon the general condition of the patient. In a series of our cases, the average length of time between accident and operation was three weeks.

When we are forced to operate we should proceed with the greatest of caution, as the X-ray cannot be relied upon for the full extent of the fracture, and large fragments may come away, involving the lateral sinus, facial nerve, or the labyrinth. These fragments do not heal by bone formation, but only by scar tissue.

If the labyrinth is involved, but there is no infection, no operation should be considered. Keep the patient in bed and administer sufficient sedatives to insure rest. In cases where the labyrinth is involved and there has been a discharge of cerebrospinal fluid, if a sudden rise in temperature and meningeal signs and symptoms develop, the labyrinth should be opened for free drainage and large doses of sulfanilamide administered. When there has been a discharge of cerebrospinal fluid, we should refrain from tapping the spinal cord, unless the intracranial pressure becomes so great that it would be considered definitely fatal not to do so.

A septic temperature immediately brings to mind the possibility of an infected lateral sinus. Blood cultures and X-ray findings of the mastoid are both helpful in determining our type of treatment. The Tobey-Ayer Jugular Compression



Test is helpful in detecting the presence of a clot in the lateral sinus. If the above signs are found to be present, a mastoidectomy should be performed, the lateral sinus opened, and a procedure following according to the pathology found.

#### CONCLUSIONS.

1. It is essential that careful neurological examinations be made, as many of these patients are very ill and an accurate history is unobtainable.

2. Efforts should be made to obtain a history regarding pre-existing infections.

3. Patients should be kept under observation for some time, as intracranial complications may develop at a late date.

4. A bloody ear canal should not be tampered with, as there is nothing to be gained, and if this rule is adhered to I believe fewer cases would come to operation.

5. Operations should be deferred as long as possible in order that protective barriers may have a chance to develop.

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12 East 63rd Street.

## SYMPOSIUM ON HEAD TRAUMA: DIAGNOSIS AND TREATMENT.

### (c)—OSTEOMYELITIS OF THE SKULL.\*

DR. JOSEPH E. J. KING, New York.

In osteomyelitis of the cranial vault, regarding etiology, I might say that direct extension into the diploe from the frontal sinus is probably most frequent; second, through the blood vessels and lymphatics; third, metastatic—from pleuropulmonary conditions, from the long bones—osteomyelitis of the long bones—and other infections, such as cellulitis of the arms and legs, etc.; fourth, from the mastoid, which is rare; and fifth, traumatic, which is really not osteomyelitis, but bone necrosis due to denudation of bone in the presence of infection which is local. Osteomyelitis is either chronic or acute.

In the chronic cases the condition may come on in a most insidious sort of manner, may spread very slowly and may be present with but few symptoms, especially in the frontal area. The disease is usually unilateral in children, because the infection is often limited by the frontal suture to one side of the frontal bone and does not travel across. The coronal suture seems to act as a barrier likewise, but the infection may traverse either suture line. In the case of metastatic osteomyelitis, the disease may extend in any direction and involve most of the cranial vault.

In the acute form associated with pansinusitis, almost before the patient has time to get to the hospital he may have an extensive osteomyelitis extending as far backward as the occipital bone. If one makes a burr hole in the back part of his head, he may find droplets of pus oozing from the diploe. There is also likely to be found a large pocket of pus in the subdural space. The infection seems to go through the diploic structure like fire through a broom-sage field.

The complications, for the most part, are: 1. brain abscess or abscesses, and 2. suppurative leptomeningitis—either or

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both. I would say that brain abscess is the more common, and meningitis less common. In an instance in which we *suspect* that an abscess is present, ventriculograms for the purpose of establishing the presence and position of the abscess are preferable to either encephalograms or exploratory punctures through an infected field.

The operation, I think without any equivocation, consists of extirpation or resection, according to the suggestion of MacKenzie, of London, who, in 1913, reported three cases. His operation was apparently forgotten by everybody until Furstenberg, of Ann Arbor, reported splendid results by that procedure in 1931. All we do, none of which is original, is to follow MacKenzie's original method, with Furstenberg's modifications. I shall show some slides of typical cases and get through with them as quickly as possible.

We found that if a posteroanterior film of the skull is made every three or four days after the possibility of osteomyelitis might be suspected, one may find just a little dark spot on the film, about the size of a five cent piece, above the supraorbital ridge, which antedates the typical moth-eaten appearance by about 12 or 14 days.

(Demonstration of slides showing Potts' puffy tumor and progressive X-rays of the skull in typical osteomyelitis of the frontal bone.)

In cases of osteomyelitis of the frontal bone limited to one side, a flap with a temporal pedicle is preferred for the reason that this allows of adequate removal of diseased bone, including the frontal sinus and ethmoids. Bleeding, if not accurately controlled, is very marked. To prevent bleeding from the scalp the incision is made for a distance of about an inch at a time and skin clips are applied to the margins and left on for about three days. By so doing, there is practically no hemorrhage from the scalp edges and there is none when the clips are removed after three days. There is usually found an abscess beneath the pericranium, and another pocket of pus extradural, above and below the area of greatest bone destruction. It is just as well to begin removal of the diseased bone centrally and continue toward the periphery until all has been removed. The frontal sinus should be cleared out of all disease and mucous membrane, and packed with iodoform gauze, to be left in position for six days and then con-

tinued until the frontal sinus is completely obliterated. This is the last portion of the wound to heal.

A strip of iodoform gauze is placed around the bone margin of the defect and left for six days. Gauze pieces wet in Dakin's solution and with two Dakin tube ends contained between the layers, are placed over the dura. The scalp flap is placed over the gauze and loosely sutured with bridge sutures to prevent shrinkage. The area is thoroughly Dakinized every one to two hours.

The gauze over the dura is removed after six days, replaced, again removed on the tenth day, and the scalp flap is loosely sutured into position without exact apposition of the scalp edges.

The entire area is healed in about two months if no complications ensue, and after six months the scars are excised and accurate suturing of the scalp edges is done. A considerable amount of re-formation of new bone takes place within one year, and after about two and a half to three years the defect is completely filled in with new bone formed between dura and pericranium. It has been observed that the last portion of the defect to be filled is the posterolateral sector.

(Several slides demonstrating osteomyelitis of frontal bone and metastatic osteomyelitis were shown.)

140 East 54th Street.

DISCUSSION OF PAPERS PRESENTED AT THE  
SEVENTY-FIRST ANNUAL MEETING OF  
THE AMERICAN OTOLOGICAL SOCIETY,  
INC., ATLANTIC CITY, N. J., MAY 5-6,  
1938, NOT PREVIOUSLY INCLUDED  
IN THE PUBLISHED  
TRANSACTIONS.

**What Is Justifiable to Do in Otitic Meningitis?**

**From the Clinical Standpoint. Dr. James G. Dwyer.**

DR. JOHN J. SHEA: The clinical part of the handling of otitic meningitis can be distinguished from the surgical part as to how much it will allow the surgeon to do. Besides relieving the elimination of septic material, he can also reduce intracranial pressure by his surgery; through medicine he can accelerate the flow of cerebral spinal fluid, both in the matter of replacing that which is lost and for flushing the cerebral spinal system.

The decision to operate should take into consideration whether or not the patient can stand the operation. Too many patients with meningitis have sacrificed their little chance by operation at a time when unable to stand the operation.

If the surgeon decides to operate, if it can be done with the nasal type of anesthetic, followed with local anesthesia rather than with general anesthetic.

After the material has been studied, there are certain definite principles that the clinician can use to assist in determining what should be done. First, if it is meningococcus, the use of anti-meningococcus serum and sulfanilamide is indicated, but there is no need for continuous drainage. The same holds good if it is a pneumococcus type of infection; whereas, if it is due either to the streptococcus or staphylococcus, the surgeon must determine what type of continuous drainage is desired, and that will be considered under the surgical part of the Symposium.

The clinician may assist in the maintenance of the fluid balance. Concentrated sugars should not be given to the patient with meningitis, as they tend to increase the intracranial pressure. The sugars should be diluted to at least 5 per cent. Glucose or its modifications may be used to maintain the proper caloric necessities of the patient.

Fluids should be forced by mouth and given in whatever type the patient will take, but certainly the fluid balance should be maintained in order that the sodium ions be kept at the proper balance.

The question of whether to give a blood transfusion should never be determined by the hemograms. The blood picture report is not as good an indication as the patient's condition and it should be left to the clinician as to whether he thinks it will help the patient. A well administered blood transfusion gives to the patient something that he cannot give to himself.

If the patient is taking sulfanilamide, he should be watched as to toxic symptoms. One of the newer things that is being done in this work is the administration of methylene-blue. The administration of 1 gr. of methylene-blue to every 10 gr. of the drug will keep down the cyanosis and will also lessen the toxic effect.

Therefore, the clinician has a part in the treatment of otitic meningitis by maintaining the best fighting resistance to the disease.

**What Is Justifiable to Do in Otitic Meningitis?****Treatment with Sulfanilamide. Dr. Emmanuel Appelbaum.**

DR. BERNARD J. MCMAHON: I have been very much interested in the administration of sulfanilamide from the clinical and especially from the laboratory standpoint during the past year. We have conducted experiments on rabbits with the idea of determining the amount of sulfanilamide which was deposited in the nasal and sinus passages in rabbits.

Dr. Neal mentioned in her discussion the fact that she had not seen any good results in the sulfanilamide treatment of sinus infections. I don't think that is due to the fact that sulfanilamide does not get to the tissues as much as the fact that there are probably mixed infections, especially in the sinuses.

We found in our rabbits that the blood sulfanilamide ranged from 17 to 75 mg. per cent and in the nasal tissues, from 17 to 18 mg. per cent, which is comparable to the figures of Marshall and Emerson and Cutting, in which they found 19 mg. per cent in liver as a maximum and 3 mg. per cent in fat as a minimum, so that we can realize that sulfanilamide is definitely deposited in nasal and sinus tissues, at least in the rabbit.

Dr. Appelbaum has brought out the fact that sulfanilamide is not deposited in bone, but in the sinus tissue bones. We have to realize that that is not solid bone. As we know, that is a very thin type of bone which has a large tissue content.

The toxic signs I think are important. We know what sulfanilamide does for the patient to cure the patient. We have to determine the bad effects of sulfanilamide so that we may know its limitations. The toxic signs which we found in these rabbits were, first, dyspnea, as has been described, and hypernoea. This hypernoea has come on as quickly as 18 hours after the administration of as small a dose as 35 gr. to a rabbit weighing between 3 and 4 pounds, on the base of 1.5 gm. per kilogram. In other rabbits, who had received five times as much sulfanilamide, there were no toxic signs, but in the majority of our rabbits toxic signs did develop. We will admit that there was a large amount of sulfanilamide in the tissues.

The toxic signs came on, the hypernoea usually first, and apathy shortly afterwards. Then as a last sign, spastic and flaccid paralysis, especially of the hind legs. The toxic signs usually abated in the reverse order of their onset.

Therefore, we can feel confident that sulfanilamide is deposited in the nasal and sinus tissues and if the infection is a pure streptococcal infection, we can also feel reasonably sure that it will be as effective in these infections as it is in streptococcal infections elsewhere. I feel that that applies equally so to infections of the mastoid, although our actual tissue examination did not actually include tissue examinations of the substance removed from infected mastoids.

These rabbits had been infected. We ran controls on rabbits which were uninfected and other rabbits which were infected with a hemolytic streptococcus which was obtained from the heart blood of patients who had died of a hemolytic streptococcus septicemia. These rabbits were allowed to live for from 10 to 14 days, about nine days before the sulfanilamide was started.

The infection was well established in the sinuses first and sulfanilamide was given for four consecutive days at maximum doses, and the rabbit was then killed. We did not attempt to entirely cure the sinus infection because we were interested in determining the effect of sulfanilamide when we were assured that infection was still present and sulfanilamide still present in the tissues.

From our studies, we also had to do with the psychological effects of sulfanilamide. There are two schools of thought: One is that sulfanilamide is a cause of neutralization of the toxin. The other is that it stimulates phagocytosis. There were no demonstrable psychological changes as the result

of the administration of sulfanilamide, with or without infection. The psychological changes which were present were due to the infection, and the administration of sulfanilamide did not influence the polymorphs of the monocytes or the amount of phagocytosis.

DR. BURT R. SHURLY: Perhaps after a long experience of some 40 years, one is entitled to grow first enthusiastic and then depressed with the various marvelous things that have been brought out and in the hundreds of them that are not so marvelous, that are failures in therapeutics. It is of the greatest value to recognize one of the most marvelous discoveries of the last few years.

We have had our diphtheria antitoxin and we know quite well how, for a period of years, the small dosage was absolutely insufficient. In starting out with 1,000 units and finally 1,500, undoubtedly many lives were lost through a period of years by not understanding the importance of the dosage of diphtheria antitoxin. Again, we have the various derivatives of salvarsan, a marvelous specific, and yet it took the profession a long time to come to a definite classification of what was the proper dosage and how to use that.

Sulfanilamide, in our experience, is one of the greatest things that we have met in the therapeutics of ear, nose and throat, and the respiratory infections as they extend down to the lungs.

Of the last 100 cases of pneumonia that we had in our hospital, six have died, and we use diathermy twice a day and the highest possible dosage of sulfanilamide.

The dangers of the use of this drug must be more thoroughly recognized by the profession. It is being sold over the counter in drug stores throughout the county, just as they sell aspirin, and the dangers of the public taking up this drug are very considerable dangers, because there are idiosyncrasies, there are toxic symptoms that can be guarded only by a definitely daily blood examination and by a white blood count. I feel that is of very great importance, and that we alone, the medical profession, should guard and understand the proper dosage and the proper use of that marvelous remedy.

We have had four cases of mastoiditis ready to operate, prepared for operation. We have had one case of petrositis prepared for operation. The surgical opinion of several men decided that these cases should be operated. We placed them under hospital observation for 24 hours and found, with oral and hypodermic administration, that the improvement was so great in 24 hours that by continuing it, these cases have recovered.

Again, that is a dangerous thing to do and to advocate, because it is only under hospital observation that we can afford to allow our surgical judgment to pass, because these cases, of course, must always have the best surgical judgment in the removal of the focus.

The toxic symptoms are, we found, such as those that come with the cyanosis and the acidosis, and can be relieved by the use of 30 gr. of bicarbonate of soda with the sulfanilamide. Toxic conditions, such as result in the presence of anemia, in the presence of renal insufficiency, and those that are in a bad general toxic condition, of course, should be watched with even greater care, if possible.

It seems to me that the table for dosage should be done as given out to the profession and must be guarded by the use of it according to the weight of the individual and according to the study of the individual case. We feel that this medication should be continued through the night. We give the dosage at least six times during the 24 hours in our streptococcus infections; it is of tremendous value. With those that are not streptococcus hemolyticus, you cannot expect the same result, although our findings are that with the pneumococcus, the improvement is of the very greatest value. So that in the complications with respiratory infections and the complications with pneumonia, we feel that we have almost a prophylactic value in the administration of sulfanilamide. I trust that we will all become familiar with the proper usage



and with the very early and prompt use and careful guarding of the blood count of these patients.

DR. PHILIP E. MELTZER: There is one thing that has impressed me greatly throughout this entire discussion of the treatment of meningitis and that is, first, by Dr. Dwyer emphasizing the fact that one must get rid of the focus; secondly, Dr. Friesner emphasizing the same thing, and in the discussion, Dr. Eagleton the same. Then the last speaker, in the discussion of the chemotherapy, said that we must get rid of the focus of infection, as though a focus of infection in the mastoid was a very definable thing and that you could eliminate it like you would a stump of appendix.

I can understand definitely how with symptomatology involving the lateral sinus, symptomatology involving the internal ear, we can say there is a pathway of infection and by eliminating that pathway, we can do something to eliminate the focus. But when you deal, particularly in the acute type of case, with a cellular mastoid, if it happens to be so constructed (and usually they are), how you can tell if it isn't one in which there is a definite coalescence involving the tegmen or some other part, with the erosion exposing dura; how can you determine where the focus is?

Dr. Eagleton seemed to think if you search for it, you can find it, but I can't, in my experience, short as it is, although I have done many of these cases. I cannot definitely say or find out where the focus of infection is, where the direct pathway is.

If that is so, then, in the cases which you cannot tell, what do you advocate? So far, we have not definitely advocated anything and although Dr. Friesner discusses what to do from a surgical standpoint so as to eliminate the focus, I think that something more specific should be given us by these gentlemen.

Therefore, I ask the question: How far do you really go in these acute cases for decompression of the cerebral fossa, either the posterior or the middle fossa? Do you advocate removing or decompressing it, and the entire taenia surface, exposing the carotid canal. If so, what about the posterior surface, in which the retrofacial group run along the sublabrynthian cells and go along the whole inferior portion of the petrous bone, and may be a source of infection to the posterior fossa? What would you do under those conditions?

Above all, can you recognize visually; that is, macroscopically, a focus of infection in a hemorrhagic type of involvement of the mastoid bone?

DR. MOSES H. LURIE: I would like to ask Dr. Appelbaum whether the New York Health Department has been doing any blood immunology studies on these patients on whom they have been using sulfanilamide?

At the Massachusetts General Hospital, Drs. Lyons and Clifford Stewart have been studying these cases from a pure blood immunology point of view, and this study of the ability of the blood to resist the infection in their mind is very important, because they have found that in cases where the system itself shows no attempt to resist the infection, the sulfanilamide does not seem to act so well on these cases.

In those cases the attempt is also made to find a donor who has a specific immunity to that organism, and on giving the serum or the blood of this donor to the patient, the sulfanilamide has been found to increase its value as far as the patient goes, from anywhere to 500 times the patient's ability to absorb and destroy the organisms.

I think that may explain the reason why sulfanilamide does not work in a number of the cases.

**What Is Justifiable to Do in Otitic Meningitis?****From the Clinical Standpoint. Dr. James G. Dwyer.**

DR. JAMES G. DWYER (Closing): I would like to say something in regard to what Dr. Seltzer said.

I mentioned at the very beginning and emphasized that if you could find the focus, and I said in many of the cases, in the very opening, common sense will tell you if you have a mastoid, if you can go in, and if it is wise to remove the focus.

Secondly, in many of these cases, if you study them, you get a lead on where the infection entered. One of our house surgeons in his very first private case, a young girl, age 14 years, who developed meningitis, for want of anything else to do, went in and exposed every place everywhere and the child got well.

In postmortem examination of some of the tissues, we have found masses of thrombosed vessels that went in from the bone right into the dura and it is my contention that in a case such as that, if you remove the bone and remove the infection, you will accomplish a good deal.

As Dr. Shurley pointed out, either three or five of their cases were ready for operation and were not operated on and got well.

In the report that we are making tomorrow, there are three cases of meningitis with frank mastoids that were refused operation and got well without mastoid or anything with meningitis. We are not advocating that. We can overstress the value of removing the focus, but if you have got a focus, and can get at it, remove it.

**What Is Justifiable to Do in Otitic Meningitis?****Treatment with Sulfanilamide. Dr. Emmanuel Appelbaum.**

DR. EMMANUEL APPELBAUM (Closing): In regard to the primary foci, of course, it is largely a surgical question which I am not competent to answer properly.

However, it is true that we have had in this group of 26 cases, six which were not operated upon and which made uneventful recovery. It is possible that in the future a more effective compound may be devised.

The amount of research that is going on is enormous. A more effective compound may be devised which may strike these primary foci very effectively.

In regard to the question about blood studies, we have not made any blood studies in this series. However, in the past we have used very effectively convalescent serum without very many successes. However, on the other hand, recently in work done by Branheim and Rosenthal with pneumococcus and meningococcus, experimental infections have shown that the combination of sulfanilamide and immune serum produces a higher percentage of recoveries in animals than the use of either of the agents alone.

In meningococcus meningitis, it is our impression, likewise clinically, that the combined use of sulfanilamide and the specific serum is more effective than the use of either one alone, and for that reason we have not discarded the use of specific serum in meningococcus meningitis. We have used a combination of that plus sulfanilamide.

**The Surgical Technique for Conservation of the Hearing in Chronic Mastoiditis. Dr. J. M. Smith.**

DR. J. M. SMITH (Closing): I really haven't anything to add except to state that this proposition of doing this modified operation, or leaving the canal wall in place is optional with the operator. He can use the method which seems to give the best results.

In some of the cases, I feel that if you can avoid cutting a flap and have the mastoid heal behind, as in the simple operation and have a perfectly clean middle ear, you avoid the radical cavity or the cavity that occurs from cutting the flap and avoid a lot of agitation that isn't necessary. It is, however, entirely optional with the operator.

In regard to cholesteatoma:

Of three cases reported in this series, one of them especially had this new radical operation done five years ago. He disappeared. Then he came into the office about six weeks ago with a recurrence of the discharge and polyp in the region of the roof of the attic. This was removed and a cholesteatoma was removed, and now there is nothing but a slight discharge again.

That case, five years ago, showed a 36 per cent loss of hearing and five years afterward, showed 34 per cent loss. The other ear, by the way, had a chronic condition and showed a 37 per cent loss. That showed a 30 per cent loss at this time.

But in summing up the situation in regard to the cholesteatoma, I feel that if you have a normal ear on the other side, owing to the tendency of the cholesteatoma to recur, it might be just as well at the time to do a radical operation so that you have complete access to your cavity afterwards.

#### **What Can Be Done for Chronic Progressive Deafness?**

**A Study in the Treatment of Deafness. Dr. C. Stewart Nash.**

DR. HARRIS P. MOSHER: I don't know of any paper which has taken up this subject as fully as Dr. Nash has done. He has now given us statistically what we can expect to accomplish in the treatment of chronic progressive deafness.

He feels, as I have felt for a long time, that the smugness of many of us, and I include myself in that, in the treatment of chronic progressive deafness is not justified.

Fifty per cent is not so bad, if those are his statistics, but we have got to find something new, something that we have not got, before we can feel satisfied with what we accomplish in the treatment of chronic progressive deafness. What that will be, I do not know.

Finding foci infection has not been satisfactory. One would think it would. I have a feeling (and it is easy to go off the handle here) that food allergy may play a larger part in chronic progressive deafness than we at the present time suppose.

DR. MARVIN F. JONES: We have to consider in otology a similar situation that acute rhinitis presents to the laryngologist.

One of the most frequent occurrences in the office of the otologist is chronic deafness. Probably we can do very little for them, but having been a subject of inflation, in spite of statistics and in spite of everything else, I did feel better with the inflation, and thank goodness, I advise it to the people and they do feel better.

As far as the situation itself is concerned, it seems to me, after having studied the various specimens that we obtain in our laboratory, the changes that take place in the ear are quite permanent. We have noticed the fibrosis, the bone changes and the sclerosis, and as the end-result of these, the deafness. It is reasonable to suppose that neither general treatment, of which we know very little, nor any local mechanical treatment is going to be of any permanent benefit to a progressive pathology.

We know that there are fluctuations in the ability to hear. We know that these fluctuations are sometimes interpreted as improvements, regardless of the method that is used, which has been all the way from treating the Eustachian tube to directing X-rays upon the ear, with absolutely no therapeutic value.

Therefore, taking the lead from what Dr. Mosher has said, I believe that we have got to call to our aid the physicist, the biochemist, in addition to the physiologists and pathologists, and give more attention to the physiology and chemistry in relation to general systemic disease.

I have a hunch that we may find the vascular system and its control, the sympathetic nervous system, greatly concerned in some of our progressive deafness cases. If such proves to be the fact and we can spot a potential deafness case early, we have some hope. I don't think one would expect to find better results than Dr. Nash has reported, and I certainly congratulate him upon the honest, painstaking work that he has presented today.

DR. HARRIS H. VAIL: I agree with a great deal of what Dr. Nash has said, but I am not satisfied with his classification of what he calls chronic progressive deafness.

I think the large field of possible improvement, of a sure improvement, in some of these conditions is the early recognition by the otologist of chronic secretory otitis media. I don't like the term "chronic otitis media." Very often, you will find the patient gives a history, following grippe, of a closed upper ear which stayed closed for months and months. Nothing was done, and when you see them, they are in that stage with adhesions and sclerosis and one thing and another, whereas if that ear had been opened up properly, the chances are that they would have fully recovered.

There is one method, I think, which might have been of help in these cases, and that is galvanism. The author mentioned that. There are various drugs about which we now know which are sympathetic stimulants, which cause dilatation. I mention one called meconine, which can be put in the other ear by galvanism and may have some favorable results. I have tried it very recently in a few cases of otosclerosis. I do not believe it is indicated in otosclerosis, but it may be indicated in chronic progressive deafness.

DR. EDMUND PRINCE FOWLER: I think it is a very clear-cut and honest presentation, and I think it shows what the results are that all of us are getting in the treatment of these cases. The classification of the diseases can be criticized this way or that, but you have got to put them down under some heading. However, I do think it is very important to put down the ages of the patients.

These results of treatment differ very much according to age and one of our main functions should be not only the treatment of deafness from various causes, but the prevention of deafness from various causes. We can and do, as you all know, prevent deafness in children in many types of deafness in children if we can get them early. I think a plea for that is worth while.

DR. J. G. WILSON: This is the type of paper that we ought to have more often, because statistics of this character give us some idea of where we are.

We are all convinced that the treatment of otosclerosis is unsatisfactory and inefficient. We have come to that conclusion many years ago, and that was why this Otosclerotic Committee was established.

We have one thing sure and certain, in regard to the morphology of it, which Dr. Mosher has referred to, as have some other men; that is, vascularity has a good deal to do with it. If you take a nodule of otosclerosis, you will find that as the disease progresses, the vascular buds go out and, of course, you know the theory of Vitonoff, that it is a stasis, and that is an ideal counsel at present.

I am also convinced that allergy plays a very decided part. In the last three or four years, I have had several cases of allergy in otosclerosis and noted very often that at the end of the allergy season the patient has dropped a little bit. But if you have that year after year, then you are going to have some trouble.

In the classification that was made of otosclerosis, there is the classification where you have the heredity, hereditary deafness, progressive deafness, nerve

deafness, in otosclerosis. But no geneticist believes that the question of heredity is the whole story. They know pretty definitely that certain factors may modify the disease, and that is what we are after, and it is by means of such papers that we get a line on it.

One way in which we can attack the problem is as follows: We can get a family with otosclerosis and we can arrange to watch those children as they grow up. People are becoming more and more conscious of that fact and allowing the doctor to do it. But one particular type is the question of uniovular twins, to which Dr. Rae referred. Dr. Albrecht in Berlin stated that in one case of uniovular twins, the disease of otosclerosis was first picked up in each twin at about the same period. There is a very emphatic statement in regard to the question of heredity.

On the other hand, one of our junior members, Dr. George E. Shambaugh, published a paper in which he showed that in the uniovular twins, that does not always happen, and I happen to have three cases of uniovular twins in which the question of environmental factors had a good deal to do with the rapid onset. It does not cure it, but it delays the time at which the disease will appear, and that is a very great consideration.

What we want to do is to pick up early cases. Whenever you have an ankylosis of the stapes, it is hopeless, as you can see, but on the other hand, if you find these cases in which the disease is beginning, then your environmental factors may come in to help you. That is why the definition of otosclerosis, so far as these papers are concerned, is excessively disappointing, although I don't know any method by which you can determine it better, when you consider the fact that a great number of our pathological cases of otosclerosis have no otosclerosis of the stapes.

DR. JAMES A. BABBIT: Some four or five months ago I became very much interested in Grant Selfridge's work, which has been reported, on vitamin deficiency in nutritional rearrangement.

Following that suggestion, we started out with several other people in Philadelphia on a combination of vitamin B, vitamin G, in connection with liver and iron extracts. I have hesitated to make any report upon this because we were dealing with a proprietary remedy whose manufacturers we did not wish to exploit, but we obtained in at least a dozen patients absolutely dramatic results, and I shall be very glad to forward the audiograms of these results.

They may be permanent results; on the other hand, they may not be permanent and may not be accurate, but they are nevertheless positively demonstrated, and I think there is a line of research which we ought to follow a little farther.

DR. F. R. SPENCER: I have had three patients in whom basal metabolism tests and correction of faulty metabolism have improved minor defects in hearing. One is a young physician whose mother has had progressive deafness to the point that she has difficulty in hearing even with an artificial hearing aid. These are all patients under observation for a long time.

With three patients showing improvement from investigation of the endocrine system, it seems to me that this particular point is worthy of more consideration than the usual attention it receives from most of us.

DR. GORDON BERRY: I am in hearty accord with the thought that we must catch these cases early.

I would like to introduce one cautionary thought: These cases tend to become less progressive from, say, 25 years of age until, say, 50. If the earnest otologist, in his effort to help to the best of his ability, uses X-ray therapy or electric therapy or endocrines or what not, and by that means should make active again the progressive deafness that has become for the moment dormant, then he will get the statistics that Dr. Nash has suggested, that some of them have become markedly worse.

We expect them to get worse, but some of us feel that if we can only hold what we have, that is some gain. Therefore, in our efforts we must use care, check carefully and be sure that we do not help along the loss.

DR. C. STEWART NASH (Closing): In regard to Dr. Vail's criticism, I agree with what he says, and perhaps he would bear with me more patiently if he had to look over about 1,500 cases and 1,500 audiograms, and then try to classify into a talk which takes 17 minutes, all the facts. His secretary otitis of course, is classified in the catarrhal group. His advice of early incision of the drum head and galvanism, I think, is good. I should agree with everything that Dr. Vail says.

Dr. Fowler's point that the age of the patient is important is a thing that I think is good. It is obvious and to get these cases early is a thing in which several men throughout the country are particularly interested.

Dr. Wilson's points on the vascularity and the allergy and heredity as factors in producing deafness I think are things with which we all agree.

I was very much interested in what Dr. Babbitt said about the use of vitamins B and G. I have been interested in that for some time. My findings are probably his. This is the first time that I have heard of his interest in this thing. I have been desperate, as perhaps many of you have, in finding something to do for these patients, particularly the patients who pay good money for services which they hope to receive.

Dr. Spencer's basal metabolism idea, I think, is a thing that we see often. Many of these cases do improve with endocrine therapy, particularly thyroid.

Dr. Berry makes a plea for the early case and notes particularly the ages between 25 and 50, when perhaps it is more progressive at one time than it is at another. I think that is true. I think the whole idea here is that when there is so much ado about catching the school children and the cases early in order to do something to prevent deafness, it would be a great consolation to know what to do.

#### **What Can Be Done for Chronic Progressive Deafness?**

##### **Surgery of the Nasopharynx in the Treatment of Chronic Progressive Deafness. Dr. D. Harold Walker.**

DR. J. C. BECK: I have recently had an opportunity to prepare a chapter for Dr. Fowler on the Eustachian tubes and even as late as this in my experience, I learned a lot of things that I never knew regarding the importance of the Eustachian tube to progressive deafness.

A new note in connection with the Eustachian tube changes are the changes in the angle of the jaw in the mandibular joint, and there is something to that from my experience in connection with improving deafness in correcting or having the dentist correct that condition.

I was interested in the statement that Dr. Walker presented in connection with the condition of the air in the rooms. I was hoping that he would say that we can soon expect air-conditioning throughout all our homes so that it would not make so much difference in the preparation for the patient.

Regarding operative conditions, such as septums or any other part in the nasal wall, I think you all know that early you get good results; later on, what does it matter? The septum operation does not hurt the patient but you do not improve his hearing one iota so far as I was able to tell in all these years, and I have operated on many. You know that there are many other indications for operating than just deafness.

I was interested in what Dr. Walker mentioned regarding the deaf-mute. I see these cases, but they quickly go down to St. Louis. I had one case that stayed long enough to make careful functional tests (it was an older child,

so I could do that) and the result was really splendid in opening the tube of that one individual. If you would like to have the complete history, I shall be glad to give it to you.

DR. MAX A. GOLDSTEIN: In the last observation of Dr. Walker's paper, he refers to the deaf-mute. We no longer recognize the old nomenclature of deaf-mutism. Such a child is either congenitally deaf or has acquired total absence of hearing from adventitious causes, but he is not mute. Since the advent of modern methods of training the deaf child, he can be taught fluent, understandable speech and take his place in the speaking world.

It is an interesting observation, however, that when adenoids were still unrecognized and neglected, almost every school for the deaf in the world was filled with such children, not congenitally deaf, but with large masses of adenoids and subsequent adhesions and blockade of the Eustachian tube track, and there ensued not only conduction deafness, but the entire conduction mechanism we gradually put out of commission, and the cochlea finally became involved from incapacity of its histologic functioning elements and consequent nerve deafness.

DR. FRANK R. SPENCER: In 1929, the late Sidney Yankauer emphasized the importance of infections of the pharyngeal bursa and the importance of these infections in increasing the impairment of hearing. He showed that these cannot be diagnosed by the postnasal mirror, but must be seen with the direct nasopharyngoscope.

Dr. Walker mentioned the importance of direct nasal pharyngoscopy. I have used this nasal pharyngoscope for many years and it helps in finding these things. He also emphasized the importance of opening with a probe, because they are overlooked with a mirror.

Following an apparently successful adenoidectomy, remnants of lymphoid tissue remain. These are often infected during infections of the upper respiratory tract. Lymphoid tissue in Rosenmueller's fossa probably does more damage to the mucosa of the Eustachian tube than occasional islands over the posterior wall of the nasopharynx and pharynx.

Since Dr. Lillie's article appeared in the Journal, I have used a preparation which he recommended to me when I wrote to him about it, prepared by Ciba, but any one of the iodides will do, with good results in some cases, although I continue to touch these islands with the cautery or surgical diathermy.

Some of you may say that these are refinements of detail. Perhaps they are, but they help these patients who have impairment of hearing, which is made worse by recurrent infections.

DR. D. HAROLD WALKER (Closing): I thank the gentlemen who were kind enough to discuss this short paper, but I am afraid they missed the important points. Perhaps it was my fault.

In other words, all of these cases have lowered bone conduction through the high tones. Dr. Hughson referred to operations on those cases and the paper which follows speaks of operations on those cases. My question on that is, why is there a loss of high tones? I am not talking about tubes. Tubes are very important, and we appreciate that, but that is secondary to infections.

My theory is that if you have a normal nose, which is doing its proper work, you will have fewer sinus infections, fewer pharyngeal infections and great absorption, which to my mind—of course, that doesn't include the teeth or any other foci which I think is very important—but if you have a normal nose so that there is good nasal breathing, you will lessen the recurrence or constant effect of sinusitis and I think that is a very important factor in it because of the loss of those high tones, which, if they do have that loss, all the operations by Dr. Hughson or Dr. Kopetzky are useless. That is the whole of it, really, the important part which I perhaps did not make prominent; that and the fact that I think if you will examine your younger children



who come to you, who are very deaf—Dr. Goldstein talked about deaf-mutes and said there wasn't any such thing. I say they're deaf and damn deaf!

In examining them, you will find that it is not always the deaf-mute, but you will find a number of cases which are frightfully dumb, even six months or a year after birth. They don't speak. There is not a bit of air in those tubes and to my mind, there never has been. My only advice is to watch out for them more than you have in the past; try that simple scheme and see if you can help them.

**The Use of Threshold and of Louder Sounds in Clinical Diagnosis and the Prescribing of Hearing Aids. Dr. Edmund Prince Fowler.**

DR. AUSTIN ALBERT HAYDEN: When Dr. Fowler first interested the Western Electric Company in audiometers in 1919, and as you have just observed in the discussion between Dr. Fletcher and Dr. Fowler, even the man who invented the audiometer and the man who uses it otologically still do not speak in the same terms or in the same language so that they can readily understand one another.

That has been one of the decided drawbacks in the way of a general acceptance of these instruments which, in my opinion, is sadly needed by otologists and by hard-of-hearing people.

I hope that Dr. Goldstein will not stress what he said about a lower limit and a higher upper limit to make a more complete chart of the entire hearing range. That sort of an instrument is absolutely all right for Central Institute for the Deaf, but no such scientific measurements need be made, in my opinion, in the otologist's office; let me say it in another way: it is much better to have an audiometer that is readily usable by the average man that can be sold at a price that will attract him to use and to buy that instrument than it is to have an instrument with the very low and the very high pitch.

Dr. Fletcher's company and other companies will be very glad to make the lower and higher pitches, but we otologists must pay for them if we demand them, and it is just that thing that the Consultant Committee of the Council on Physiotherapy of the American Medical Association has tried to keep away from.

DR. GOLDSTEIN: A low tone frequency of 64 db. can be added to the audiometer at but slight additional expense and this added value to the performance of the audiometer may be of considerable service and should be given favorable consideration in the deliberations of the Consultant Committee of the Council.

DR. EDMUND PRINCE FOWLER (Closing): Evidently I was not very clear in my representation. Perhaps by repetition I can clear it.

If the bone conduction measurements are true measurements, if the patient really hears them, as they usually do; in other words, if they are normal, if you put that bone conduction into that same person's ear 10 db. above what he heard before and balance it against the 10 db. above with the air conduction, they should approximately balance. If their threshold is true, they should come somewhere near the same loudness 10 db. above threshold, either by air conduction or bone conduction.

In this case and in other similar cases, although the air conduction goes true to form and goes up 5, 10 or 15 db. in loudness correctly, the patient does not hear the bone conduction at all until you get up to nearly 40, and then it takes that degree of loudness above threshold by bone conduction to balance a like increase above the air conduction threshold of this patient.

There is no other conclusion, to my mind. They simply did not hear that. They got some kind of a sensation, but it was not the sound. This was not an obstructive deafness, this was not a perfect hearing by the nerve at these frequencies; it was down pretty nearly as far as the air conduction.

DR. FLETCHER: Do you mean to say you tested that first intensity and then raised it 40 db. and while you were doing that, he did not hear anything?

DR. FOWLER: He did not hear it, and it was alternately. You will find it often that way. Here is what happened: You are giving him, by air conduction alternating with bone, something to compare; you are giving him a pattern to listen to; there is no question about it. I mean, it is just the same as you and I weighing two things in two hands and seeing how much they weigh.

DR. LURIE: May I ask if the bone conduction and the air conduction are the same zero line.

DR. FOWLER: In regard to the frequency of 64, I believe that, as Dr. Fletcher has said, I think 128 or really 256 will give you all the information that the lower frequencies will give. If they are accurately made, they will give you all the information that the lower will, and there is no occasion, in my opinion, for 64; in fact, if you start at 128, it is quite high enough to start.

However, if you want to use 64, you can use this method of balance of loudness to try it out and see whether you really feel it or not. The method is available and it is very simple. You can do it in two seconds.

I am sorry that somebody did not discuss tinnitus. That is the thing which intrigued me.

#### **Tuning Fork Tests Reported in Terms of Decibels. Dr. Robert J. Hunter.**

DR. AUSTIN A. HAYDEN: The work of physicists and the work of men such as Dr. Fletcher is, of course, very important in the application of the underlying principle of the construction of the audiometer, and I think has its use; I firmly believe that we otologists are no more interested in the details of those mathematics, the logarithmic formulas that have been shown in such great profusion this afternoon, than the listener to an orchestra is interested in the five-finger exercises. They are interested only in the final result.

That final result can be divided into two parts: The result that is presented to the otologist, which he applies to his patients, and the patient is the final answer.

DR. ROBERT J. HUNTER (Closing): The point that I wanted to make was to forget these sigmas and lambdas, and when you calibrate your forks, just divide by those numbers. When you read the paper, you will see that I realize that that is not an extremely scientific method, but I think from a practical standpoint, if you can get otologists thinking in terms of that, you cannot get them to understand logarithms, but if you can devise a method, even though it is an excellent one and suitable for a physician's laboratory, if you can devise a method by which they can easily think in those terms, a step will be made in advance.

The forks chosen were intentionally not the best forks, because most people do not have those forks. As a matter of fact, I did have available the very best of forks. We have at the Philadelphia General Hospital a set of Bezold Edelman forks. I called up the Institute man and he tells me that the best quotation on those forks would be \$400 today. Very few of us are purchasing \$400 sets of forks. I used a few of those forks also and did not find a significant difference. Of course, they are far better than the ordinary Hartmann forks.

I have taken up this question of variations of amplitude. One point is that although from a theoretical standpoint, we have the amplitude going down, as Dr. Fletcher said, from a practical standpoint you will find that the forks, according to make, vary according to the way they are held and according to the way in which they have been activated, and in many other ways that have been brought before the attention of this Society.

Therefore, I feel that an audiometer bids fair to be a more standard and more accurate measure of the intensity of hearing than tuning forks, but there are a number of people who do not have audiometers and this affords a method for them to use.

Another point is that in standardizing forks, two years ago in the symposium on bone conduction, it was advised that a fork be standardized as against a well standardized audiometer. Well, of course, if you wish to make your tuning fork test correspond exactly with the audiometer, there could be no better method. You are forcing the fork to equal the amount and that is an excellent method if you wish to have the two tests agree, but many men do not have a well standardized audiometer to use in calibrating the forks and this method gives them an opportunity to do so.

**Xanthomatosis (Schuller-Christian's Disease); a Report of a Case with Radiosensitive Pathology in the Mastoid. Dr. John J. Shea.**

DR. V. V. WOOD: While I can testify to the inefficiency of operation, this patient of mine had a bilateral postreticular tumor. It was one of the youngest cases I can find in the literature (11 months of age).

Symptoms had been noticed by her rather ignorant parents, but it probably had been going on much before they had noticed it. The first thing they noticed was a discharge of one ear and then the other. Then they noticed the swellings behind the mastoid.

There is one very interesting thing, which shows the rapidity with which these new bone lesions form. We had a complete X-ray examination of the entire bone. We had five of them. Up to the time that we took the last plate, the case had been under observation for six or seven months; there was no other lesion evident in the bony skeleton, either the skull or the entire body, except the mastoid lesions.

The last series of plates were taken on Oct. 16, prior to the time that I reported the case in Chicago on Jan. 11 of last year. On Jan. 2, just before going to Chicago, I wanted to get the last data on the case. During that time at least one-third or one-seventh of the ribs had been destroyed completely, decalcified. There was a large area in the other seven ribs. There were two small areas in the left tibia. There were numerous lesions that appeared on the skull in that length of time. Four other X-ray examinations of the entire bony skeleton had shown no progress of the disease. That all occurred under X-ray therapy.

We tried vitamin diet and pituitrin, and we did everything we could find in the literature on that case, but the patient died just a few days after I reported it in Chicago, from terminal pneumonia.

We had a complete postmortem done on everything except the brain, and that was the thing in which I was most interested. They would not let us have the brain. I operated on this case and when I got through, got into the tumor, the bony cortex, the outer cortex, was gone; the inner table was gone, there was no floor in the cranial fossa, and you could insert your finger generally as far as you dared, making me think that the dura and brain had been involved, but I did not get the chance to determine that.

The case is in the December Annals and in the Transactions of the Trilical.

**The Endolymph. Dr. LeRoy M. Polvogt.**

DR. STACY R. GUILD: In 1927, at the New York meeting of this Society, I presented some experimental work on circulation of endolymph in the guinea pig, to which Dr. Polvogt has so kindly referred. I greatly regret that that work has been accepted without checking by anyone. To the best of my knowledge, there is not in the literature of the world any study which has repeated or in another method confirmed or rejected the theoretical conclusions which I drew from the experiments I made.

I feel that that is a serious handicap. People have accepted it and that is just too bad, because we do not know whether or not it is so.

Last year, in the Symposium, at the meeting at Long Beach, I pointed out that we are almost totally ignorant of the biochemistry of the inner ear and that there is great need for more knowledge.

In the lantern slide which Dr. Polvogt used, it all looks very simple; I mean the system there, the unrolled cochlea, the parts all out. It looks as though we should be able to get at that and answer it quickly.

I would like to make, with your permission, the principal part of my discussion a rapid review of some lantern slides which Dr. Polvogt kindly brought along when he found that Dr. Crowe was not coming, of human material, just to point out the anatomy, how complex this is compared with the diagram.

(Slide) This is a midsection of the human cochlea. The perilymph occupies these spaces; the scala tympani, the endolymph, this is the cochlear duct which you all know.

(Slide) This is simply a higher power slide of the first one. The stria vascularis here, the spiral ligament, bone, from this direction to the endolymph, and perilymph through that, to this side, separated by Reissner's membrane, very thin. Everyone thinks from its appearance it must be permeable, but we have no proof whatsoever, from the standpoint of the biochemist, as to the properties of that membrane, that one or that one; nothing which is comparable to what we know of other parts of the body.

(Slide) The end of the cochlear duct shows here. This is the part at the end of that nice diagram that Dr. Polvogt showed, that goes over to the narrow section of the sacculus. The sacculus does not show in this photograph. This is the utricle. There are two connections.

I put this in to show the beginning of the endolymphatic duct, actual size. The next slide will show the enlargement.

(Slide) This happened to be a lantern slide for another purpose. There is the aqueductus vestibuli. What you see from that distance is the bone. About half of that is occupied by the membrane. I want to call attention to that, compared to a semicircular canal. Here is the crista and so forth, things with which you are familiar. It is tiny, of the order of magnitude of 40 or 50 microns frequently, in that narrow portion.

(Slide) You notice where it was buried, also, way down in the center of things. Here is the external canal, the drum, the semicircular canals, the sacculus endolymphaticus. You can hardly see it. Here it goes out into the dura. You can hardly see these folds unless you are close by, but I want to show the real size of it, because that is the only way to do it, to compare it with something with which you are familiar.

(Slide) This happens to be a horizontal section. Here is one cochlear duct, there is another endolymphatic sac. It is in the bone, not out in the dura. It is complicated back here.

(Slide) This is a high-power slide of one of those little folds. It is not a simple little flat sac as it is usually described. This is a human case; the same kind of thing in a guinea pig. Notice this spot here, like a gland crypt, and out here another one.

I want to call attention to the blood vessels into which I have said the endolymph goes eventually. After coming through a wall in a place like this, into the stroma; here is a vessel, here is another, here is a capillary vessel, all through the specialized area; they are numerous. Now, try to get in there and get a sample of endolymph out of there without tapping this stuff so you can study it!

(Slide) This is another high-powered slide of this area. You see the vessels particularly, the free cells in the lumen of the endolymphatic sac. To my mind, that evidence is much better than any injecting of material such as

I did with the guinea pig. The guinea pig has many of these cells. That is the only part of the endolymphatic system which contains cells.

In man, the cat, dog, monkey, rat, rabbit, all forms that I have ever looked at, including the amphibian forms, birds, there are cells and they are of many types, not only pigment cells, but frequently others. The fact that normally there are cells and cellular debris makes it look as though the endolymph comes down this way and the particles are filtered out as it presses it, as through a filter paper.

That is how complex that little simple diagram is when you come to work at it. That is the reason why, in our group and around the world in general, more definite statements cannot be made. People have not overcome the barrier. Dr. Polvogt has been working, as I know, trying hard to overcome the barriers in certain aspects of this. He will be years doing it. Our group will be years before we can make reports of the type we would like to make.

### BOOK REVIEWS.

**Diseases of the Nose, Throat and Ear, for Practitioners and Students.** Edited by A. Logan Turner, M.D., LL.D., F.R.C.S.E., Consulting Surgeon, Ear and Throat Departments, Royal Infirmary, Edinburgh, with the collaboration of J. S. Fraser, Douglas Guthrie, Charles E. Scott, J. D. Lithgow, G. Ewart Martin and John P. Stewart. Fourth edition revised and enlarged with 243 illustrations and 21 plates, eight of which are in color. Baltimore: William Wood and Co. Price \$6.00.

This volume, in its fourth edition, can continue to be recommended as by far the best short treatise on its subject for the student and also for the general practitioner.

From its first publication, this textbook has been remarkable for the excellence of its illustrations and its index. The new edition continues these features and seems the same as its predecessors; but close study reveals many valuable changes. The illustrations are fewer, but comprise a vast number of photographs of specimens, histopathological sections and patients; and there are 21 excellent plates, of which five are beautifully colored. Certain out-of-date procedures have been deleted and thus space has been found for alterations or additions to subjects such as allergy, petrositis and audiometry. The descriptions of diseased processes and of treatments have been modernized. The total result is a short, up-to-date text without a rival in its field.

D. E. S. W.

**Cancer Laringeo su Tratamiento Quirurgico.** By Ricardo H. Bisi, Ex-interno del Hospital Nacional de Clinicas Medico del Servicio de Oto-rino-laringologia de los Hospitales Nacional de Clinicas y Alvear. With 355 pages and 101 figures. English summary. Buenos Aires: Libreria y Editorial "El Ateneo," 1938.

The primary object of this book, as stated by the author, is the presentation of an aggregate picture of laryngeal surgery.

All aspects of laryngeal carcinoma from history to plastics are accorded adequate treatment. Following a detailed classification of the varieties of cancer, 15 applicable operative procedures are described. The fundamental consideration is represented as being, not the histological structure of the growth, but rather the possibility of removal of all newly formed tissue. In this connection it is strongly advocated that simple laryngectomy be supplanted in many cases by operations which allow removal of the pre-epiglottic space and larynx without opening it. A considerable portion of the book devoted to the author's personal operative technique demonstrates the application of this concept.

The book is profusely illustrated with X-ray photographs and instructive diagrams. An index in outline form adds to the value of this work.

The author has unquestionably achieved his stated purpose and has made a definite contribution to the literature of laryngeal cancer.

H. B. O.

